



Prevention of Significant Deterioration (PSD)  
Air Permit Application for Plant  
OX Modernization/Debottleneck Project

BP Amoco Chemical Company – Cooper River Plant  
Wando, South Carolina

April 2013, Revised March 2014

***Non-confidential***



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TRC Environmental Corporation/ BP Amoco Chemical Company - Cooper River Plant  
PSD Air Permit Application  
OX Modernization/Debottleneck Project

***Non-confidential***

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# Section 1

## Introduction

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### 1.1 Background

BP Amoco Chemical Company – Cooper River Plant (BP CR) currently owns and operates a chemical manufacturing facility in Wando, South Carolina that produces purified terephthalic acid (PTA). The BP CR plant, wholly owned and operated by BP, is located on a 6,000-acre site in Berkeley County, South Carolina on the east bank of the Cooper River, about 16 miles upstream of the Atlantic Ocean. The facility location is as follows:

BP Amoco Chemical Company – Cooper River Plant  
1306 Amoco Drive  
Wando, South Carolina 29492

The BP CR Plant falls under the Standard Industrial Classification (SIC) Code 2869. The product PTA is a white, inert powder used to make polyester fibers, bottles, and films. The major raw materials in the production of PTA are paraxylene (PX), acetic acid (HAC), and hydrogen. Plant operation consists of the following five major processes:

1. Oxidation (OX) units for production of crude terephthalic acid (TA)
2. PTA units for purification of crude TA into PTA
3. Product loading/shipping
4. Utilities
5. Wastewater treatment.

Crude TA is produced in the OX units by the air oxidation of PX in an HAC solution and the presence of a catalyst at high temperature and pressure. The crude TA is crystallized and separated from the mother liquor and dried. Catalyst and mother liquor recycle are routinely operated at very high rates as a result of waste minimization and economic initiatives at the plant.

Crude TA is purified in the PTA units in an aqueous solution by hydrogenation in the presence of a catalyst. The purified product is crystallized, separated, dried, and shipped. Reject product from the silo baghouse, or loading shaker screens is routinely rerun, as an alternative to sending it to the wastewater treatment unit. TA solids in the wastewater treatment plant (WWTP) influent are settled out, recovered, and can be sold as a product, BACA (byproduct aromatic carboxylic acid).



## 1.2 Purpose and Scope

BP CR has retained TRC Environmental Corporation (TRC) to assist in the preparation of an air construction permit application package for the proposed revisions at the BP CR facility. BP CR is currently a Title V source and a major source for both hazardous air pollutants (HAPs) and Prevention of Significant Deterioration (PSD). BP CR is proposing revisions to the #1 OX and #2 OX units to debottleneck these units so they are able to operate at their design production on a consistent basis. Minor revisions to the #1 and #2 PTA are also proposed that will not impact their capacity but will reduce their production costs. This project will be a phased construction with the initial work on the #1 OX and PTA units beginning in late 2014 and the revised units expected to start-up in mid to late 2016. The work on the #2 OX and PTA units is expected to begin in early 2017 and the revised units startup to occur by early 2019.

This project will result in an actual annual hourly (TA and PTA) production rate closer to the unit design rate. This project will not result in any increase in the maximum hourly emissions, the maximum hourly production rate, the maximum annual potential emission rates, or the maximum annual potential production rates above those used in previous permit applications. The project will modify the cooling tower systems to provide additional cooling capacity. This project will not revise any of the other auxiliary facilities but will require slightly more boiler steam, increase PX flow through the Tank Farm, and increase the PTA production into the product silos and loading that can all be provided without any changes to these systems. The project is referred to as the OX Modernization/Debottleneck Project.

These revisions will be completed over the next 5 years as unit shutdowns allow the tie-ins to be completed.

A PSD applicability analysis has been performed for the project recognizing that the area is in attainment for all pollutants. The PSD applicability analysis for this project recognizes the impact of the revisions on both OX and PTA units and the additional steam production, wastewater treatment, and shipping volumes necessary to accommodate these changes. The project PSD applicability analysis demonstrates that a significant net emissions increase will occur for carbon monoxide (CO) and volatile organic compounds (VOCs); therefore the project is subject to review under the PSD permitting program for those pollutants. Other pollutants were evaluated and determined to have increases that are projected to be less than PSD significance thresholds so they will only be subject to the normal air construction permitting. The Federal Land Manager (FLM) responsible for the Romaine Wilderness area, which is a federal Class 1 Wilderness about 30 miles from the site, was contacted to determine the FLM's interest in the PSD application. After providing the FLM with the emissions impacts from the project, the FLM replied by email (see Appendix F) that they were not requesting that a Class I Air Quality Related Value (AQRV) analysis be included in the PSD permit application. BP CR is required to file a permit application

with South Carolina Department of Health and Environmental Control (SC DHEC) to obtain approval to commence construction on the project via the issuance of an air construction permit. To satisfy this requirement, this permit application has been prepared in accordance with SC DHEC guidelines for air construction permitting including the required PSD permitting elements for CO and VOC. This application contains the following items:

- n Section 1 Introduction
- n Section 2 Project Description
- n Section 3 Regulatory Assessment
- n Section 4 Best Available Control Technology Analysis for Volatile Organic Compound Emissions and Carbon Monoxide
- n Section 5 Air Quality Analysis
- n Section 6 Additional Impacts Analysis
- n Appendix A SC DHEC Permit Application Forms
- n Appendix B Emissions Data and Calculations
- n Appendix C RBLC Search Results
- n Appendix D BACT Analysis Cost Information

### 1.3 Facility Location and Contact

All correspondence regarding this permit application should be sent to:

Mr. Brent Pace, P.E.  
Environmental Engineer  
BP Cooper River Plant  
1306 Amoco Drive  
Wando, SC 29492  
[Brent.Pace@bp.com](mailto:Brent.Pace@bp.com)  
843.881.5182

and

Mr. Michael Doerner  
TRC Environmental Corporation  
30 Patewood Drive, Suite 300  
Greenville, SC 29615  
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864.234.9481

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## Section 2

# Project Description

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### 2.1 Existing Process Description

The BP CR processes consist of the two OX units, the two PTA units, and the shipping and loading area. The OX areas are where the process actually begins producing TA. In the PTA units, the TA is purified to produce PTA and sent to shipping and loading where it is stored in one of several silos and loaded into shipping containers. A simplified flow of the overall process is shown in Figure 2-1.1. Simplified process diagrams of the existing processes are shown in Figure 2-1.2 through Figure 2-1.5.

In the OX unit, a BP proprietary process is used for the catalytic liquid phase air oxidation of PX to produce TA. HAC, PX, and catalyst solution are mixed in a feed mix drum. The feed mix from the drum and air from the process air compressor are continuously fed to the reactors. Exothermic heat of reaction is removed by condensing the boiling reaction solvent. A portion of this condensate is withdrawn to control the water concentration in the reactor and the remainder is refluxed back to the reactor.

Reactor effluent is depressurized and cooled to filtering conditions in a series of crystallizers to form the solid TA crystals. Air is fed to the first crystallizer for additional reaction. The crystallizer temperatures are controlled by allowing a portion of the reaction solvent to flash off. The crystallizer vent streams are sent to the dehydration tower (DHT) or the High Pressure Absorber (HPA) for recovery of valuable materials. The DHT also removes water formed in the reaction. The crystallizer precipitate TA is recovered by filtration and finally dried. The dried TA solids are conveyed to the OX intermediate storage silos (TA) silos and stored for additional processing in the PTA unit.

The off-gas from the OX reactors is combined with the DHT overhead gases that have been compressed in the low pressure vent gas treatment (LPVGT) equipment. The combined gases pass through a recovery device, the HPA, before being sent to a control device, the high pressure vent gas treatment system (HPVGTS) in which CO, VOC, and HAP are nearly totally destroyed and then the gas is emitted to the atmosphere. The HPVGTS reactor contains catalyst bricks that are routinely changed out based on their activity and mechanical condition. Further processing in the OX unit is required to recover and purify HAC from the reactor outlet, crystallizer solvent withdrawal streams, and also from the un-recycled mother liquor stream. OX byproducts are separated from the HAC in a *confidential* evaporation process and then purged.

The PTA unit is also a continuous operation. Crude TA is fed from the OX intermediate storage silos to the feed slurry drum to produce the slurry of TA crystals and water. The slurry is heated to dissolve the TA and then the slurry enters the hydrogenation reactor where it reacts to convert the impurities into a form that can be separated from the product. The PTA reactor catalyst is routinely changed out based on its activity and mechanical condition. After reaction, the solution goes through a cycle of lowering the pressure and cooling to crystallize the PTA. A portion of the aromatic acids in the mother liquor are recovered by cooling and filtering the mother liquor; the aromatic acids are recycled back to the OX reaction unit.

The crystallized PTA is recovered from the mother liquor by separation in the filtration section of the unit. The final product is dried and transferred to the PTA day silos and then to the PTA product storage silos.

The #1 and #2 Cooling Towers supply non-contact cooling water to the respective #1 OX/PTA and #2 OX/PTA units. The Cooling Tower particulate matter (PM) emissions are Title V insignificant activities.

## 2.2 Project Description

The BP CR Modernization/Debottleneck project will be revising the OX and PTA units to remove limitations that prevent the OX units from operating at their unit design rates and reduce the OX and PTA unit operating costs. These revisions will include improvements to the reaction environment, additional air capacity, optimization of the recovery systems, improved DHT operation, improved energy recovery, removal of several emission points, dense phase conveying and additional cooling tower capacity. Simplified process diagrams of the future processes are shown in Figures 2-2.1 to 2-2.4.

The changes to the existing OX unit process description include the following items:

- n PX would bypass the feed mix drum and be sent directly to the reactor.
- n The first crystallizer vent stream for both units will only be sent to the HPA for recovery of valuable materials.
- n The LPVGT will be removed so the DHT overhead vent stream will be routed to the Low Pressure Absorber (LPA) before being exhausted
- n The DHT operation will be converted to an azeotropic distillation process and an additional tower will be added to recover the azeotropic chemical
- n The two-stage evaporation process to remove byproducts and the catalyst recovery process will be removed

BP CR proposes to complete the unit revisions over the next 5 years as unit shutdowns allow the tie-ins to be completed and the equipment to be installed.

The major equipment revisions included in the proposed project are the following items on the units:

1. #1 OX unit

- Replacement of four reactors (BR-301 A-D) with a single more efficient reactor (BR-301)
- Replacement of reactor overhead condenser system
- Replacing the air compressor rotor to reduce energy consumption
- Direct PX injection to reactor
- Additional reactor overhead recovery capacity by replacing equipment with an improved design
- Route 1<sup>st</sup> crystallizer (BD-401) vent to reactor off-gas recovery system
- Maintain power recovery in off-gas expander by lowering upstream pressure drop
- Azeotropic distillation on DHT (*azeotropic distillation* refers to the technique of adding another component to generate a new, lower-boiling azeotrope that is heterogeneous [e.g., producing two, immiscible liquid phases].)
- Revised DHT overhead recovery system to a two-stage system by:
  - § Routing existing DHT Scrubber (BT-702) vent to LPA (BT-603)
  - § Revise LPA packing
  - § Convert DHT Scrubber to a one-stage acid scrubber
- Revised HPA (T-401) internals
- Dense phase conveying by changing system piping and rotary locks to allow conveying solids with less carrier gas
- Additional filtration capacity
- Removal of the LPVGT compressor (BC-710)
- Removal of the solvent stripper (BT-605)
- Removal of the residue evaporator (BM-606) and catalyst recovery unit (BD-625/631/632/BE-645)
- Removal of PX Stripper (BT-740)
- Addition of a steam turbine to generate power from excess low pressure steam

## 2. #1 PTA unit

- Revisions to crystallizer vent scrubber (CM-301) to improve energy recovery
- Addition of 5th crystallizer (CD-30x)
- Dense phase conveying by changing system piping and rotary locks to allow conveying solids with less carrier gas

## 3. #2 OX unit

- Direct PX injection to reactor
- Rerating the process air compressors for additional capacity
- Replacement of reactor overhead condenser
- Azeotropic distillation on DHT (*azeotropic distillation* refers to the technique of adding another component to generate a new, lower-boiling azeotrope that is heterogeneous [e.g., producing two, immiscible liquid phases].)
- Modified packing or trays in DHT (DT-403), HPA (DT-111), LPA (DT-302), Dryer Scrubber (DT-301) and HPVGTS Scrubber (DT-1821).
- Routing DHT vent to revised LPA system
- Dense phase conveying by changing system piping and rotary locks to allow conveying solids with less carrier gas
- Removal of the LPVGT compressor (DC-304)
- Removal of a portion of the solvent stripper (DT-402) system
- Removal of the residue evaporator (DM-403) and catalyst recovery unit (DD-412/413/414/DE-416)
- Removal of PX Stripper (DT-404)
- Addition of a steam turbine to generate power from excess steam

## 4. #2 PTA Unit

- Revisions to crystallizer vent scrubber (DM-601) to improve energy recovery
- Revision of piping system from PTA Feed Drum (DD-500) to the Sundyne pumps.
- Addition of a 4th Sundyne pump
- Dense phase conveying
- Replacement of dryer (DM-703)
- Dense phase conveying by changing system piping and rotary locks to allow conveying solids with less carrier gas

## 5. Cooling Towers

- Additional #1 Cooling Tower capacity
- Additional #2 Cooling Tower capacity

The project will also include smaller items that will occur on all the units in the following general categories:

1. Additional and/or improved automation, multivariable control schemes, and on-line analyzers to increase unit reliability and improve process control.
2. Replacement of process equipment and piping that are negatively impacting maintenance costs and unit reliability.
3. Replacement of obsolete or end-of-life equipment.
4. Replacement of exchangers and vessels to improve metallurgy, reduce corrosion, and reduce maintenance costs.

## 2.3 Unit Emissions

Emissions calculations for the units and a summary of the facility-wide emissions are included in Appendix B (Tables B-1 through B-11) of this application to determine PSD applicability. A summary of the PSD analysis in Appendix B is shown in Table 2.3.1 indicating that the only pollutants with increases above the baseline actual emissions greater than the PSD significance thresholds are CO and VOC. The unit's potential-to-emit (PTE) emissions are based on 8,760 hours per year of operation at their design capacities. The emissions include the impact of the incremental boiler steam production emissions, and the increased tank farm and shipping and loading emissions due to additional PTA production. The boilers have excess capacity available within their previously permitted limits and can provide the steam without making any revisions to the boilers. Both the Tank Farm and the Shipping and Loading areas have the capacity available to handle the increased flows without requiring any modifications. The addition of the azeotropic distillation to the OX units will add new pollutants (n-butyl acetate and butanol) to the emissions from the units.

The emissions calculations in Appendix B provide the various emissions estimates requested in the applications forms. The PSD emission calculations for the modified units (#1 OX, #2 OX, #1 PTA, #2 PTA, and Cooling Towers) are based on Post Project PTE – Baseline Average Emissions (BAE). The PSD emission calculations for the unmodified but debottlenecked units (Tank Farm and Shipping) are based on PTE-BAE. The PSD emission calculations for the incremental boiler steam are based on the emissions from producing the additional steam required by the project. The pre- and post-emissions are calculated for both the controlled and uncontrolled scenarios. The uncontrolled emissions estimates assume 0 percent recovery/

removal for the control devices. The emissions calculations are included in Appendix B in the following tables as shown in Table 2.3.2.

Table 2.3.1  
Prevention of Significant Deterioration Analysis Summary

**Step 1**

POLLUTANTS	TOTAL PTE (before BACT)	TOTAL TWO-YEAR BASELINE AVERAGE	DELTA	PSD SIGNIFICANCE	ABOVE PSD
NO <sub>x</sub>	30.7	3.1	27.6	40	No
VOC	402.8	319.9	82.9	40	Yes
CO	771.9	346.7	425.2	100	Yes
SO <sub>2</sub>	0.3	0.04	0.3	40	No
PM	40.7	33.7	7.0	25	No
PM <sub>10</sub>	39.6	33.0	6.7	15	No
PM <sub>2.5</sub>	36.9	31.1	5.8	10	No
CO <sub>2</sub> e	87,098	69,793	17,304	75,000	No

**Contemporaneous Emissions**

PROJECT	YEAR	CO (tpy)	VOC (tpy)
502b10 - CR #1 OX BR-301A Alternate Water Withdrawal	2008	0.0	0
PTA FIP Project (Permit CS)	2008	0.01	8.24
502b10 - #1 OX/PTA Op Flex	2011	0	0
PTA BHS Filter Project	2012	26.9	27.6
<b>Total</b>	---	<b>26.9</b>	<b>35.8</b>

**Step 2 – Facility Netting**

POLLUTANTS	VOC	CO	NO <sub>x</sub>	SO <sub>2</sub>	PM	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub> e
Step 1 Delta	82.9	425.2	27.6	0.3	7.0	6.7	5.8	17304.2
Total Contemporaneous	35.8	26.9	N/A	N/A	N/A	N/A	N/A	N/A
Net Emissions	118.8	452.1	27.6	0.3	7.0	6.7	5.8	17304.2
PSD Significance	40	100	40	40	25	15	10	75,000
Above PSD	Yes	Yes	No	No	No	No	No	No



Table 2.3.2  
Appendix B Tables

TABLE NO	CALCULATION
1	PSD Applicability Summary
2 through 7	PSD Applicability for Modified Units
8 through 9	Debottleneck Emissions for Unmodified Units
10	Boiler Emissions from Incremental Steam Production
11	Post Project Facility-Wide Controlled Emissions
12	Uncontrolled Pre- and Post-Project PTE Emission Summary
13 through 18	Uncontrolled Pre- and Post-Project Modified Unit PTE Emissions
19	Facility Pre-project Controlled PTE Emissions Summary
20 through 25	Modified Units Pre-project PTE Emissions
26	Unmodified Unit Controlled and Uncontrolled PTE Emissions Summary
27 through 29	Unmodified Unit Controlled and Uncontrolled PTE Emissions
30	HAPs Emissions
31	Cooling Tower Sample Calculations

## 2.4 Prevention of Significant Deterioration Emission Limits

As a result of this application and the Best Available Control Technology (BACT) analysis included for VOC and CO emissions, the following existing PSD avoidance limits shown in Table 2.4.1 are requested to be removed and replaced by the applicable BACT/PSD limits shown in the table. The PSD analysis has included the emission impacts of the removal of these PSD avoidance limits on the resulting PTE emissions.

Table 2.4.1  
Emission Limit Revisions

EMISSION POINT	POLLUTANT	PREVIOUS PSD AVOIDANCE LIMITS <sup>(1)</sup>	REQUESTED BACT/PSD LIMITS (tpy)	SHORT-TERM BACT/PSD LIMITS (lbs/hr)
#1 OX LPA	VOC	80 tpy and 40 lb/hr	42.0	12
	CO	40 tpy	18.0	5
#1 DHT Scrubber	VOC	165 tpy and 60 lb/hr	N/A – no longer vents to atmosphere	
	CO	380 tpy		

Table 2.4.1  
Emission Limit Revisions

EMISSION POINT	POLLUTANT	PREVIOUS PSD AVOIDANCE LIMITS <sup>(1)</sup>	REQUESTED BACT/PSD LIMITS (tpy)	SHORT-TERM BACT/PSD LIMITS (lbs/hr)
#1 HPVGTS	VOC	80 tpy and 85 lb/hr	20.5	6
	CO	375 tpy and 1,452 lb/hr	385.0	106
#1 PTA Crystallizer Vent Scrubber	VOC	None	46.5	13
#2 LPA	VOC	215.9 tpy and 49.3 lb/hr	38.8	11
#2 OX HPVGTS			15.3	5
#2 PTA Crystallizer Vent Scrubber			46.5	13
#2 LPA	CO	None	15.2	5
#2 OX HPVGTS			329.0	90
Combined total for #1 OX and #2 OX, #1 PTA and #2 PTA	VOC	1,825 tpy	Replaced by individual vent limits	

<sup>(1)</sup> All these previous PSD avoidance limits are requested to be removed

BP will continue to abide by all of the other synthetic minor (PSD avoidance) limits in the existing Title V permit as they presently exist. This includes all limits for PM, particulate matter (nominally 10 microns or less) (PM<sub>10</sub>), nitrogen oxides (NO<sub>x</sub>), and sulfur dioxide (SO<sub>2</sub>) in the existing Title V permit. Table 2.4.2 shows those synthetic minor limits that will remain unchanged and to which CR BP will continue to abide.

Table 2.4.2  
Unchanged Synthetic Minor Emission Limits

EMISSION POINT	POLLUTANT	PSD AVOIDANCE LIMITS
#1 OX Silo Scrubber	PM <sub>10</sub>	2.16 lb/hr
Silos CF-701 A-E	PM <sub>10</sub>	1.08 lb/hr (each)
Silo CF-701 F	PM <sub>10</sub>	0.48 lb/hr
Boilers AB-350 A/B	PM/PM <sub>10</sub>	50.9 tpy combined
	SO <sub>2</sub>	733.4 tpy combined
	NO <sub>x</sub>	317.0 tpy combined
	CO	299.6 tpy combined

## 2.5 Best Available Control Technology Monitoring

Table 2.5.1 is a summary of the proposed monitoring parameters from the BACT analysis contained in Section 4 of this application. The operational ranges for the proposed monitoring parameters will be submitted to SC DHEC along with supporting documentation within 180 days of completing the project construction. The operational range of the parameters will be determined based on operational and stack test data, vendor recommendations, equipment design properties, as visual inspections as appropriate for a parameter.

Table 2.5.1  
BACT Monitoring Parameters

UNIT	EMISSION POINT	POLLUTANT	PARAMETER 1 MONITORED	PARAMETER 2 MONITORED
#1 OX	LPA	VOC	Scrubbing Liquid Fluid Flow	Scrubber Top Temperature
	HPVGTS	VOC	Reactor Inlet Temperature	Reactor Outlet Temperature
	Equipment Fugitives	VOC	HON LDAR Monitoring program	N/A
#2 OX	LPA	VOC	Scrubbing Liquid Fluid Flow	Scrubber Top Temperature
	HPVGTS	VOC	Reactor Inlet Temperature	Reactor Outlet Temperature
	Equipment Fugitives	VOC	HON LDAR Monitoring program	N/A
#1 PTA	Crystallizer Vent Scrubber	VOC	Specialized Performance Test every 5 years	N/A
#2 PTA	Crystallizer Vent Scrubber	VOC	Specialized Performance Test every 5 years	N/A
#1 OX	LPA	CO	None	N/A
	HPVGTS	CO	Reactor Inlet Temperature	Reactor Outlet Temperature
#2 OX	LPA	CO	None	N/A
	HPVGTS	CO	Reactor Inlet Temperature	Reactor Outlet Temperature

Table 2.5.2 indicates the monitoring and reporting frequency for the BACT monitoring parameters. For parameters that have a monitoring frequency specified as “continuously with daily average,” at least one data point shall be obtained each 15-minute period and all data points collected within a 24-hour period (during those times that the process or emissions generating equipment was being operated) shall be averaged together for a daily reading for comparison to an established monitoring range. All records of the parameters will maintained for at least 5 years after being recorded.

Table 2.5.2  
BACT Monitoring Frequency and Reporting

UNIT	EMISSION POINT	PARAMETER	FREQUENCY	REPORTING
#1 OX	LPA	Scrubbing Liquid Flow	Continuously with daily average	Semiannual
		Scrubber Top Temperature	Continuously with daily average	Semiannual
	HPVGTS	Reactor Inlet Temperature	Continuously with daily average	Semiannual
		Reactor Inlet Temperature	Continuously with daily average	Semiannual
	Equipment Fugitives	HON LDAR Monitoring	Per HON LDAR regulation	Semiannual
#2 OX	LPA	Scrubbing Liquid Flow	Continuously with daily average	Semiannual
		Scrubber Top Temperature	Continuously with daily average	Semiannual
	HPVGTS	Reactor Inlet Temperature	Continuously with daily average	Semiannual
		Reactor Inlet Temperature	Continuously with daily average	Semiannual
	Equipment Fugitives	HON LDAR Monitoring	Per HON LDAR regulation	Semiannual
#1 PTA	Crystallizer Vent Scrubber	Special Performance Test	Every 5 years	Every 5 years
#2 PTA	Crystallizer Vent Scrubber	Special Performance Test	Every 5 years	Every 5 years

Figure 2-1.1  
BP Cooper River Overall Process Flow Diagram

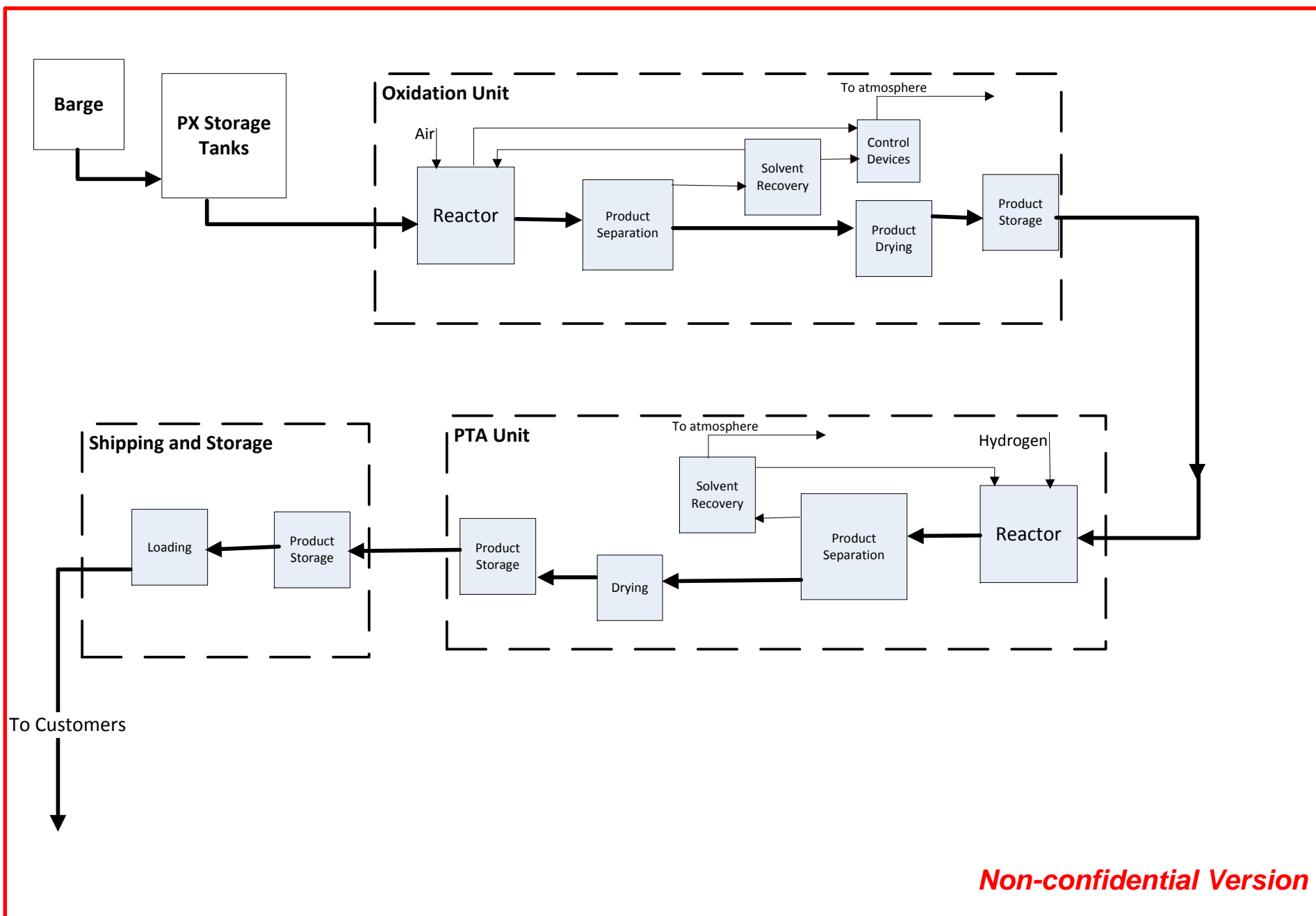
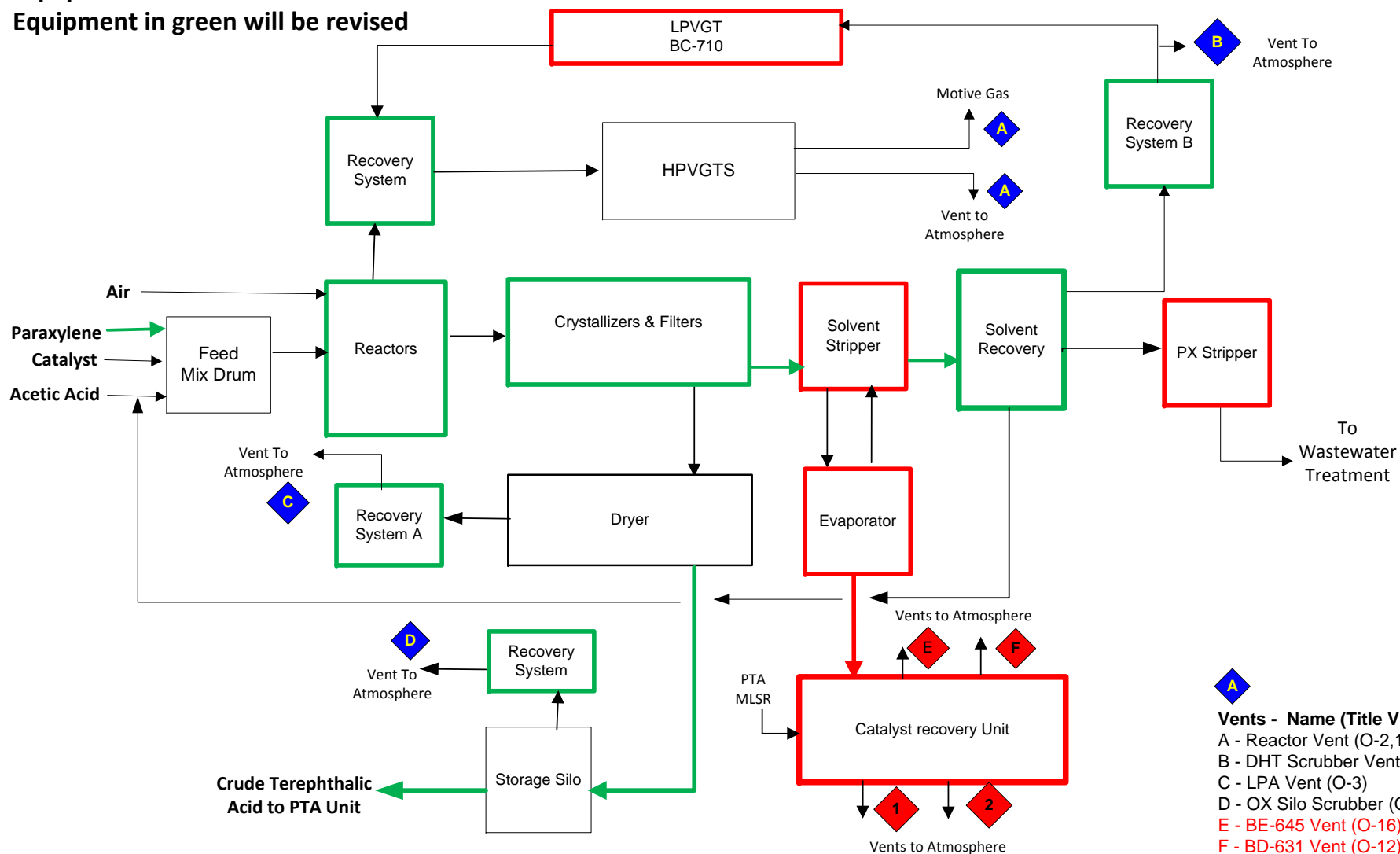


Figure 2-1.2  
#1 OX Unit Existing Process Flow Diagram

Equipment in red will be removed  
Equipment in green will be revised

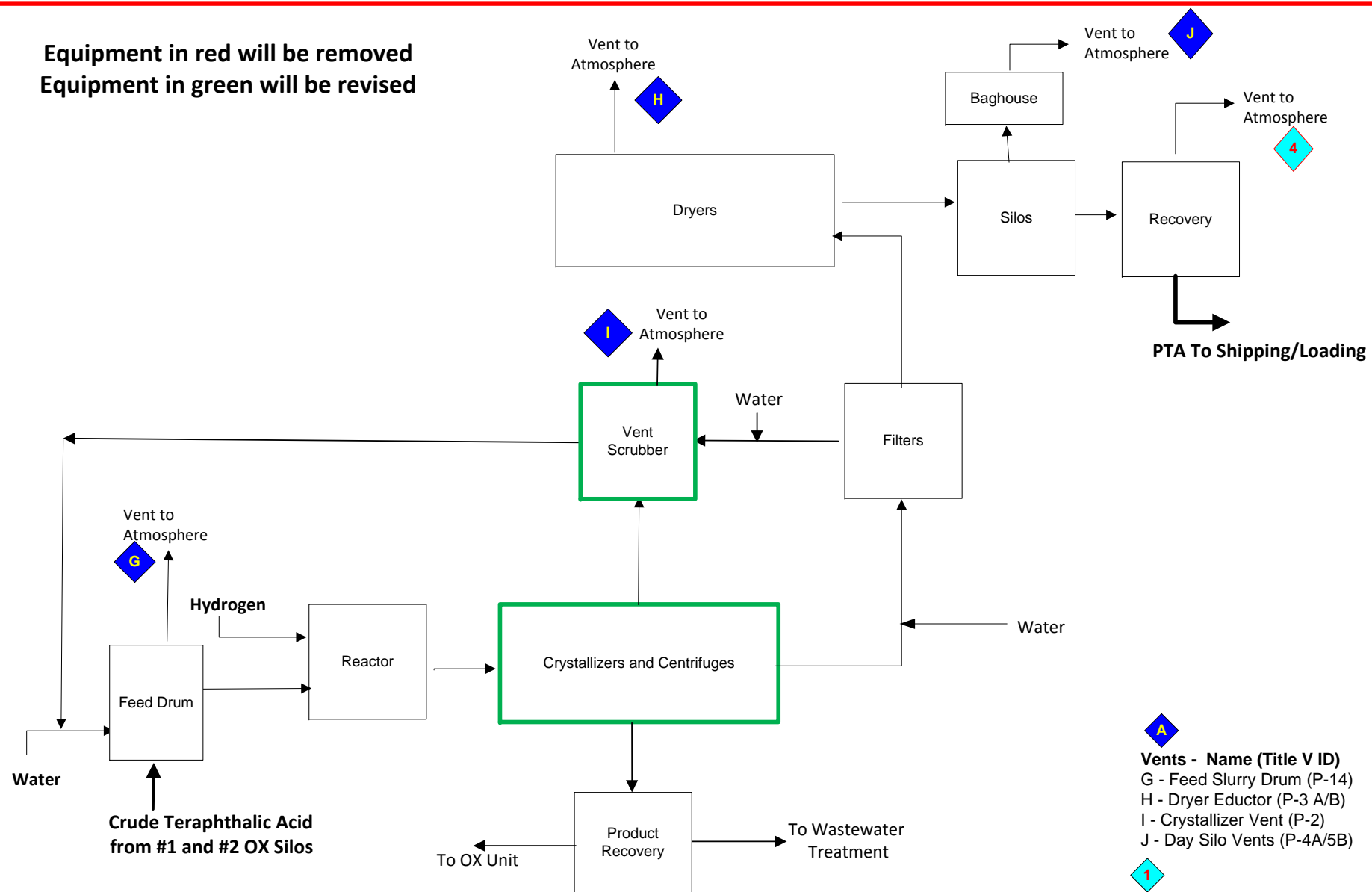


- Vents - Name (Title V ID)**
- A - Reactor Vent (O-2,10,15)
  - B - DHT Scrubber Vent (O-23)
  - C - LPA Vent (O-3)
  - D - OX Silo Scrubber (O-22)
  - E - BE-645 Vent (O-16)
  - F - BD-631 Vent (O-12)
- Insignificant Vents**
- 1 - BD-632 Vent (O-13)
  - 2 - BD-625 Vent (O-11)

**Non-confidential Version**

Figure 2-1.3  
#1 PTA Unit Existing Process Flow Diagram

Equipment in red will be removed  
Equipment in green will be revised



Non-confidential Version

Figure 2-1.4  
#2 OX Unit Existing Process Flow Diagram

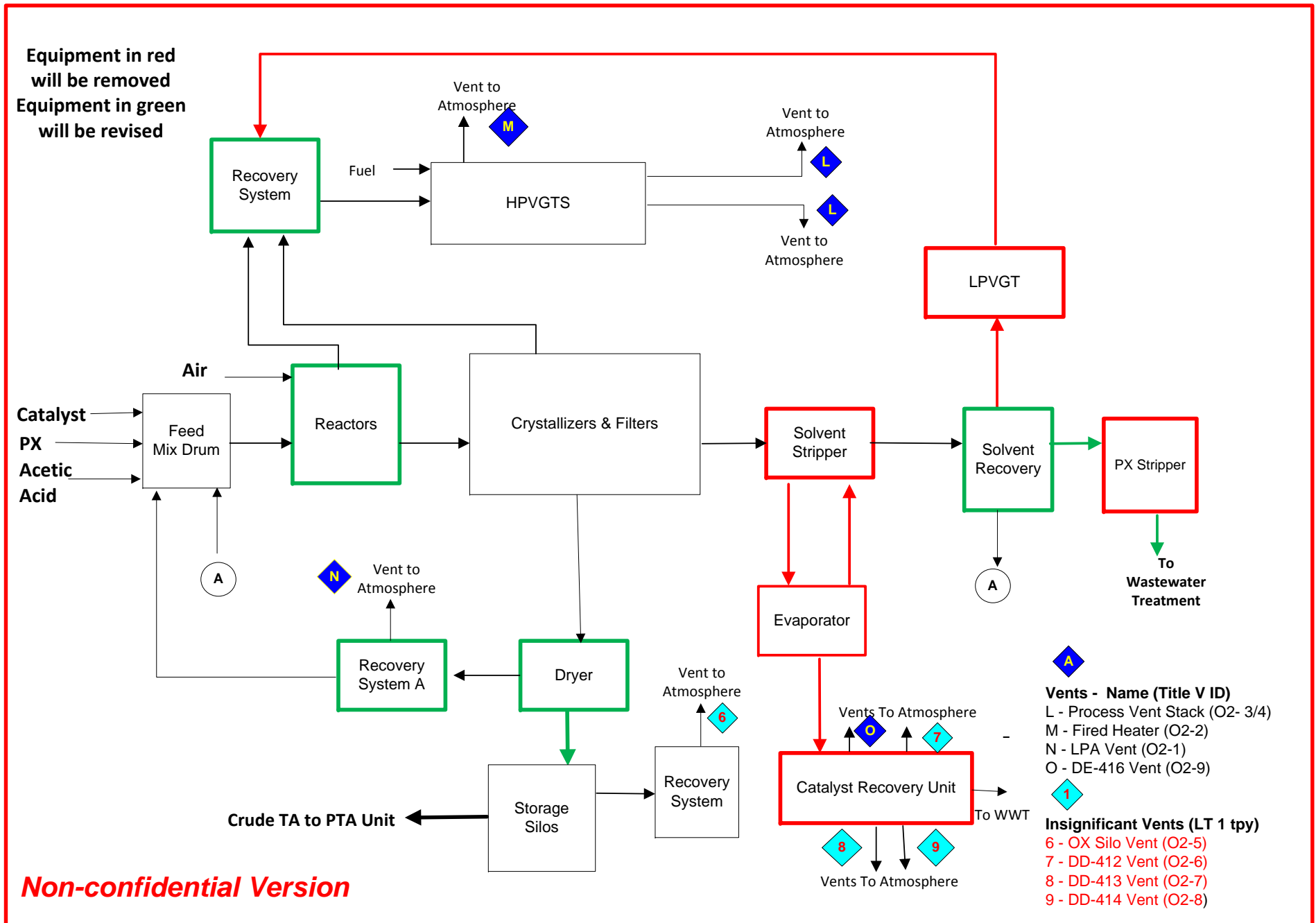
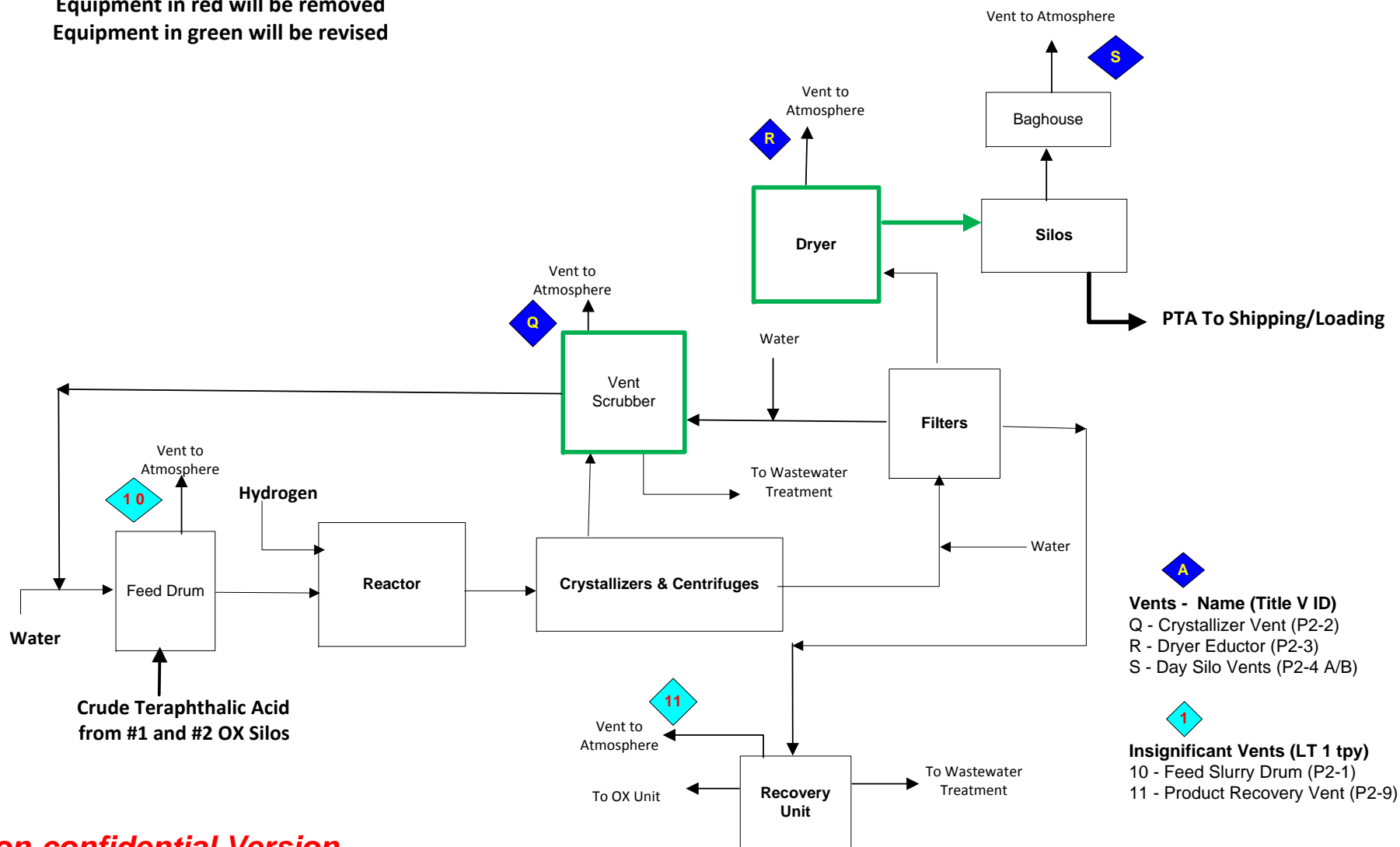




Figure 2-1.5  
#2 PTA Unit Existing Process Flow Diagram

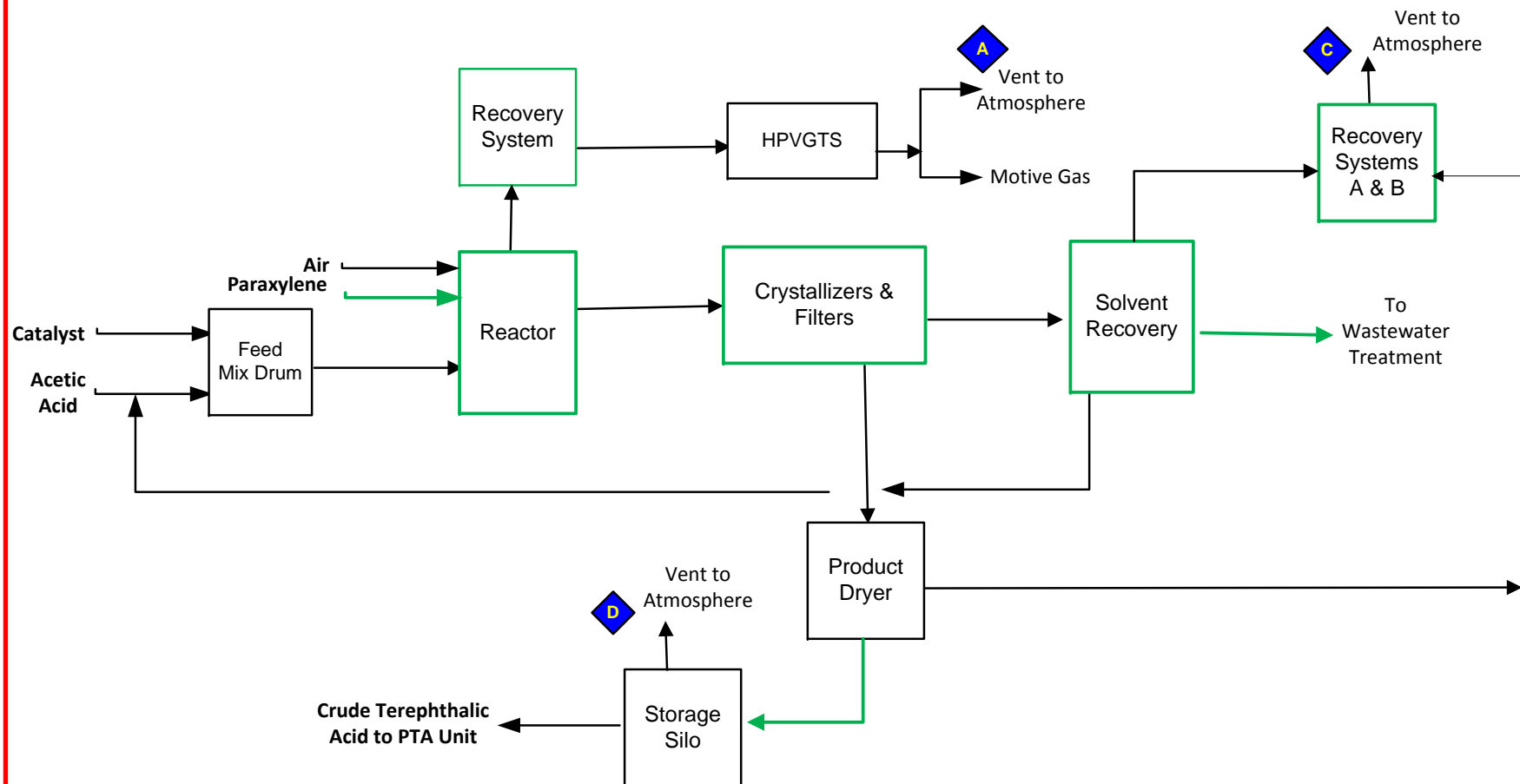
Equipment in red will be removed  
Equipment in green will be revised



**Non-confidential Version**

Figure 2-2.1  
#1 OX Unit Future Process Flow Diagram

Equipment in green will be revised



Vents - Name (Title V ID)  
 A - Reactor Vent (O-2,10,15)  
 C - LPA Vent (O-3)  
 D - OX Silo Scrubber (O-22)

**Non-confidential Version**

Figure 2-2.2  
#1 PTA Unit Future Process Flow Diagram

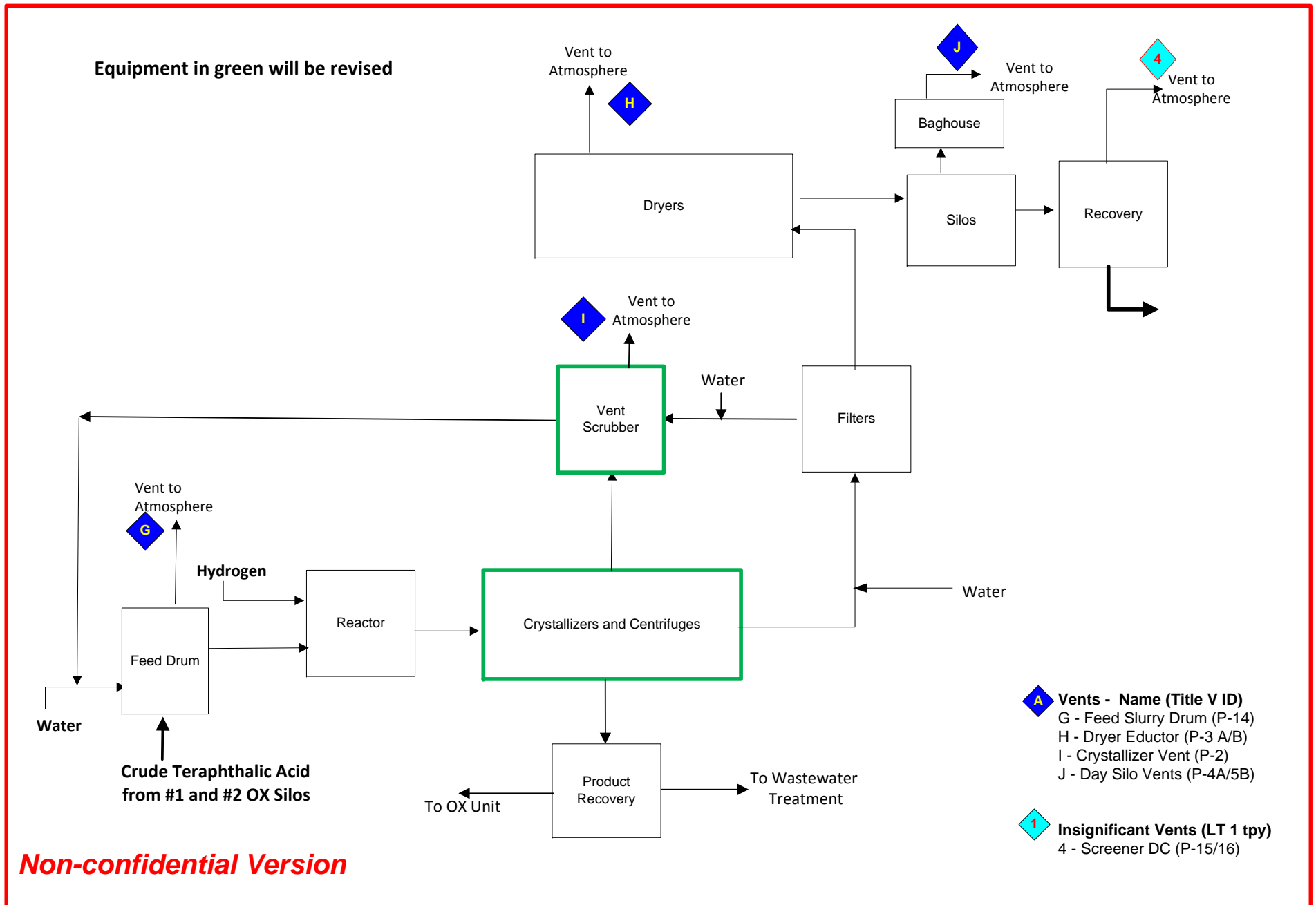
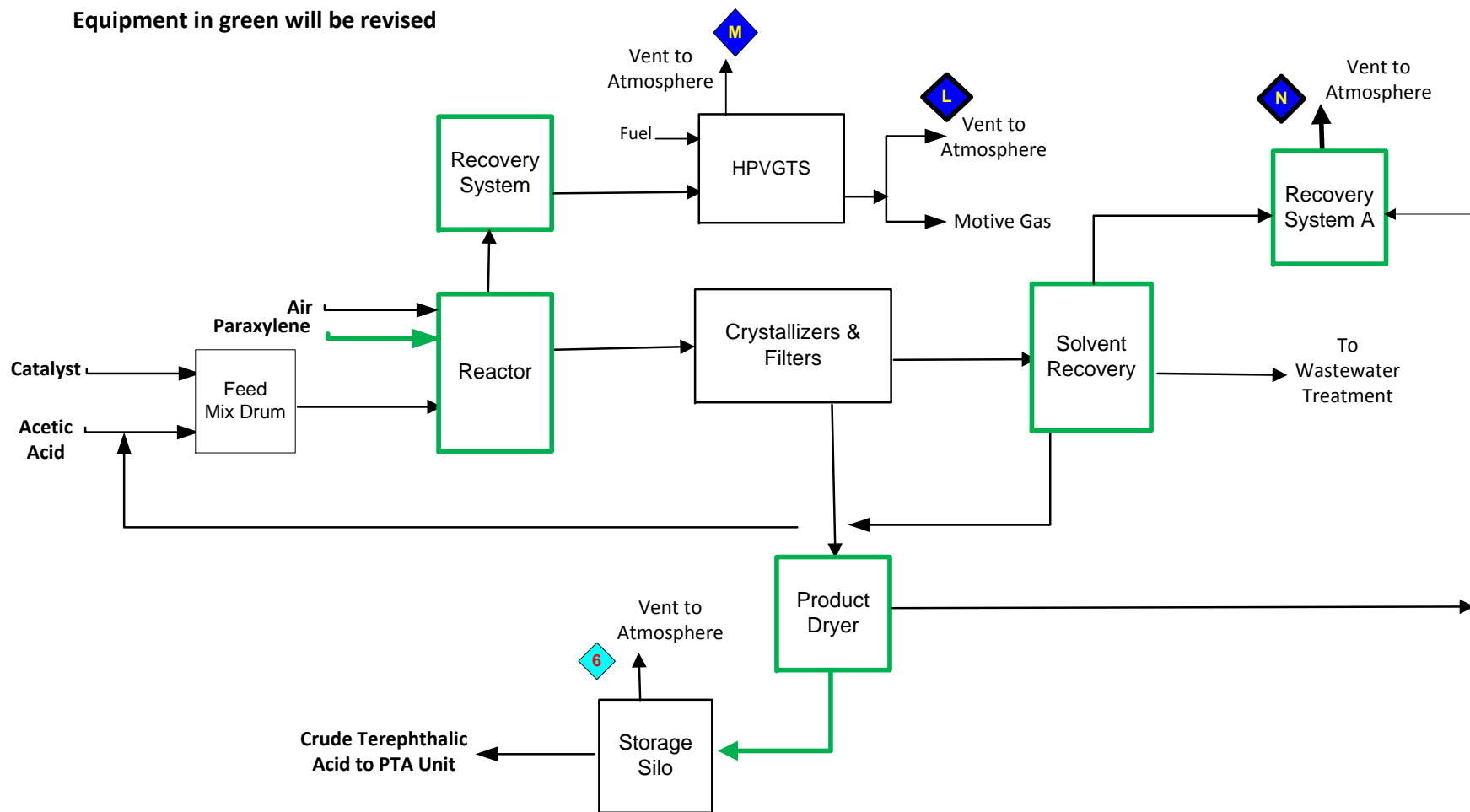


Figure 2-2.3  
#2 OX Unit Future Process Flow Diagram

Equipment in green will be revised

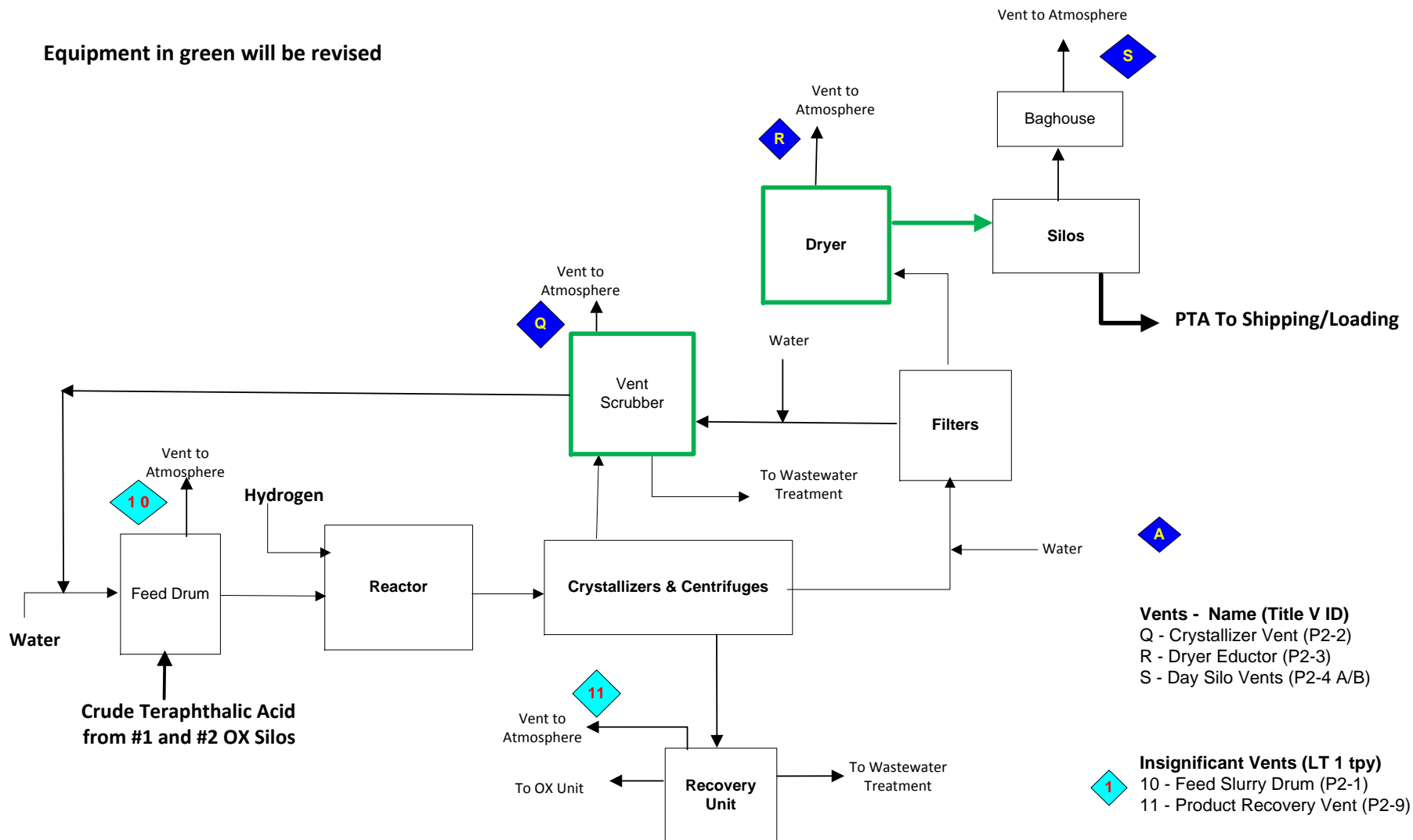


**Vents - Name (Title V ID)**  
 L - Process Vent Stack (O2- 3/4)  
 M - Fired Heater (O2-2)  
 N - LPA Vent (O2-1)

**Insignificant Vents (LT 1 tpy)**  
 6 - Ox Silo Scrubber (O2-5)

Figure 2-2.4  
#2 PTA Unit Future Process Flow Diagram

Equipment in green will be revised



Non-confidential Version

## Section 3

# Applicable Regulations

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A regulatory assessment was completed for the proposed OX Modernization/Debottleneck Project at the BP CR Plant. A review of both South Carolina and Federal regulations was conducted to determine the applicable air quality requirements for the proposed project. Each potentially applicable regulation is summarized in Table 3-1 and is described in the following subsections and, where applicable, the emissions limits are outlined as well as the required record keeping and monitoring requirements.

### 3.1 State Regulations

The following state regulations are potentially applicable to this project.

#### 3.1.1 South Carolina Air Quality Rule 61-62.1 Section II - Permit Requirements

This regulation is applicable to the project because it states that any person who plans to construct, alter, or add to a source of air contaminants, including installation of any device for the control of air contaminant discharges, shall first obtain a construction permit from the Department prior to commencement of construction. This application is being submitted to meet this requirement.

#### 3.1.2 South Carolina Air Quality Rule 61-62.5 Standard No. 1

This regulation is applicable to fuel combustion sources and includes emission limits for visible emissions (opacity), SO<sub>2</sub>, and PM. This regulation would apply to the heater for the #1 OX HPVGTS. The proposed project will not change any of the existing limits or requirements for the facility.

#### 3.1.3 South Carolina Air Quality Rule 61-62.5 Standard No. 2

This regulation is applicable to the facility. The CO PSD modeling using AERMOD shows the emissions impacts of the project are below the significant impact level. Therefore, no further modeling analysis of emissions for Standard No. 2 is needed.

Table 3-1  
Summary of Potentially Applicable Regulation

REGULATORY ASSESSMENT SUMMARY		
POTENTIALLY APPLICABLE REGULATIONS		APPLICABLE TO PROJECT
<b>State (SC DHEC) Regulations</b>		
SC DHEC Reg 61-62.5 Section II	Permit Requirements	Y
SC DHEC Reg 61-62.5 Std. No. 1	Emissions from Fuel Burning Operations	Y
SC DHEC Reg 61-62.5 Std. No. 1	Ambient Air Quality Standards	Y
SC DHEC Reg 61-62.5 Std. No. 3	Waste Combustion and Reduction	N
SC DHEC Reg 61-62.5 Std. No. 4	Emissions from Process Industries	Y
SC DHEC Reg 61-62.5 Std. No. 5.1	BACT/Lowest Achievable Emission Rate (LAER) Applicable to VOCs	Y
SC DHEC Reg 61-62.5 Std. No. 5.2	Control of NO <sub>x</sub>	N
SC DHEC Reg 61-62.5 Std. No. 7	PSD	Y
SC DHEC Reg 61-62.5 Std. No. 8	TAPs	Y
SC DHEC Reg 61-62.7	GEP Stack Height	Y
SC DHEC Reg 61-62.60	NSPS	Y
SC DHEC Reg 61-62.61	National Emission Standards for Hazardous Air Pollutant (NESHAP)	Y
SC DHEC Reg 61-62.63	NESHAPs for Source Categories	Y
<b>Federal Regulations</b>		
40 CFR Part 60, Subpart A	General Provisions	Y
40 CFR Part 60, Subpart Da	NSPS for Electric Utility Steam Generating Units	N
40 CFR Part 60, Subpart Db	NSPS for Industrial-Commercial-Institutional Steam Generating Units	Y
40 CFR Part 60, Subpart Kb	NSPS for Volatile Organic Liquid Storage Tanks	N
40 CFR Part 60, Subpart VV	NSPS for Equipment Leaks of VOC in the SOCM I Before November 7, 2006	Y
40 CFR Part 60, Subpart VVa	NSPS for Equipment Leaks of VOC in the SOCM I After November 7, 2006	Y
40 CFR Part 60, Subpart III	NSPS for VOC Emissions from the SOCM I Air Oxidation Unit Processes	Y
40 CFR Part 60, Subpart NNN	NSPS for VOC Emissions from SOCM I Distillation Operations	Y

Table 3-1  
Summary of Potentially Applicable Regulation

REGULATORY ASSESSMENT SUMMARY		
POTENTIALLY APPLICABLE REGULATIONS		APPLICABLE TO PROJECT
40 CFR Part 60, Subpart RRR	NSPS for VOC Emissions from SOCMI Reactor Operations	N
40 CFR Part 60, Subpart YYY (proposed)	VOC Emissions from SOCMI Wastewater	Will review when rule finalized
40 CFR Part 60, Subpart IIII	NSPS for Stationary Compression Ignition Internal Combustion Engines	N
40 CFR Part 61, Subpart M	National Emission Standard for Asbestos	Y
40 CFR Part 61, Subpart FF	National Emission Standard for Benzene Waste Operations	Y
40 CFR Part 63, Subpart A	NESHAPs for Source Categories; General Provisions	Y
40 CFR Part 63, Subpart F	NESHAPs for Source Categories; HON from SOCMI	Y
40 CFR Part 63, Subpart G	NESHAPs for Source Categories; HON from SOCMI for Process Vents, Storage Vessels, Transfer Operations, and Wastewater	Y
40 CFR Part 63, Subpart H	NESHAPs for Source Categories; HON for Equipment Leaks	Y
40 CFR Part 63, Subpart EEEE	NESHAPs for Organic Liquids Distribution (Non-Gasoline)	N
40 CFR Part 63, Subpart ZZZZ	NESHAPs for Stationary RICEs	Y
40 CFR Part 63, Subpart DDDDD	NESHAPs for Industrial, Commercial, and Institutional Boilers and Process Heaters	Y
40 CFR Part 63, Subpart GGGGG	NESHAPs for Site Remediation	Y
40 CFR Part 64	CAM	Y



### 3.1.4 South Carolina Air Quality Rule 61-62.5 Standard No. 3

This regulation is shown as an applicable regulation for the HPVGTS catalytic oxidation reactor in the existing Title V permit. However, in the Title V renewal application submitted in January 2012, the following justification was provided to remove this as an applicable regulation:

*The existing Title V permit has both of the HPVGTS reactors subject to the SC DHEC regulation 61-62.5 Standard 3 (Waste Combustion and Reduction). The HPVGTS is not a combustion system as was intended to be covered by this regulation. However, even if the regulation is potentially applicable to the HPVGTS since the outlet of the reactors pass through a liquid scrubber prior to being released to the atmosphere it is not possible for either PM or visible emissions from the reactor to be emitted. We request that SC DHEC either agree that the regulation is not applicable to the HPVGTS or that it be exempted since the pollutants of potential concern cannot be emitted by the system.*

### 3.1.5 South Carolina Air Quality Rule 61-62.5 Standard No. 4

The #1 OX/PTA and #2 OX/PTA units have emissions that are subject to this standard. All emission sources, including any fugitives, are subject to 20 percent opacity and PM limits under this standard. The proposed project does not change the process weight for any unit so it does not change any limits or create any new requirements for the affected units under this regulation.

### 3.1.6 South Carolina Air Quality Rule 61-62.5 Standard No. 5.1

This standard applies to the site overall. Since the net VOC emissions increase is less than 100 tons per year (tpy), this regulation has no applicable requirements for this project. However, since the net VOC emission increase exceeds the PSD threshold, a VOC BACT analysis has been completed for this PSD permit application and is included in Section 4 of the application.

### 3.1.7 South Carolina Air Quality Rule 61-62.5 Standard No. 5.2

This standard does not apply to this project since no new fuel combustion source is being built and none of the existing fuel combustion sources burners are being replaced in this project.

### 3.1.8 South Carolina Air Quality Rule 61-62.5 Standard No. 7

This standard will apply to this project since the facility is a PSD major source and the net emissions increase for at least one PSD pollutant exceeds the PSD threshold. This application is for a PSD permit for the pollutants exceeding the threshold. The results of the PSD analysis are shown in Table B-1 in Appendix B.

### 3.1.9 South Carolina Air Quality Rule 61-62.5 Standard No. 8

This standard would be applicable to the project since the units are a source of toxic air pollutants (TAPs). However, since both the OX and PTA units are subject to the HON Maximum Achievable Control Technology (MACT) regulation they are exempt per Standard No. 8 Section I (D) from the regulation. Therefore, air toxics modeling of the revised facility is not required by the regulation.

### 3.1.10 South Carolina Air Quality Rule 61-62.7

This regulation requires all emissions stacks to be in compliance with good engineering practice (GEP) provisions. All stacks have previously been assessed for compliance with GEP provisions and this project will not change any of the stacks.

### 3.1.11 South Carolina Air Quality Rule 61-62.60

This regulation is applicable to the project since the affected units are subject to 40 CFR Part 60 regulations that are incorporated by reference in this state regulation. This regulation will be met by the facility meeting the requirements contained in the applicable federal 40 CFR Part 60 regulations. A regulation-specific description of the requirements is contained in subsequent subsections discussing the applicable federal regulations.

### 3.1.12 South Carolina Air Quality Rule 61-62.61

This regulation is applicable to the unit since the facility in general is subject to 40 CFR Part 61 regulations (Subparts M and FF) that are incorporated by reference in this state regulation. This regulation will be met by the facility meeting the requirements contained in the applicable federal 40 CFR Part 61 regulations. The proposed project does not create any new or revise any requirements for the facility under this regulation.

### 3.1.13 South Carolina Air Quality Rule 61-62.63

This regulation is applicable to the affected units since they are subject to 40 CFR Part 63 regulations that are incorporated by reference in this state regulation. This regulation will be met by meeting the requirements contained in the applicable federal 40 CFR Part 63 regulations discussed in a later section. The proposed project does subject the units to applicability of any new federal regulations under this regulation. A regulation specific description of the requirements is contained in subsequent subsections.

## 3.2 Federal Regulations

The following federal regulations are potentially applicable to this project.

### 3.2.1 40 CFR Part 60, Subpart A

This regulation is applicable to the units and provides general requirements for emissions from source categories. This project will not change the requirements of this regulation to the affected units.

### 3.2.2 40 CFR Part 60, Subpart Da

This regulation is not applicable to the boilers. They may supply some portion of their steam to the steam turbines being added to the units to generate electricity but it will only be a small portion of their steam capacity and any electricity generated will be for internal use and none will be sold to a third party.

### 3.2.3 40 CFR Part 60, Subpart Db

This regulation is applicable to the boilers. This project will require incremental steam from the boilers but they will not be modified or increase previously permitted emissions. This project will not add any new or revise any requirements of the regulation.

### 3.2.4 40 CFR Part 60, Subpart Kb

The new tanks being added to the units to store the NBA or NBA/Butanol/PX mixtures will meet the minimum size to be subject to the regulation. However, the material stored has a vapor pressure at storage temperatures that is less than the minimum vapor pressure (3.5 kPa) needed for the regulation to apply to the new tanks. This regulation is not applicable to this project.

### 3.2.5 40 CFR Part 60, Subpart VV

The #2 OX and PTA units are subject to the New Source Performance Standard (NSPS) for equipment leaks of VOC in Synthetic Organic Chemical Manufacturing Industry (SOCMI) as set forth in 40 CFR 60, Subpart VV. The #1 OX and PTA units were built before the regulatory applicability date and they have not been modified as defined in the regulation since the applicability date so they are not subject to this regulation. In 2007, BP CR voluntarily agreed to implement a VOC Leak Detection and Repair (LDAR) program equivalent to Subpart VV for the #1 unit as a PSD offset. Neither #1 nor #2 PTA units have any process streams containing over 10 percent VOC content. BP CR is currently in compliance with all requirements of Subpart VV.

The BACT analysis for fugitives in Section 4 concluded that monitoring all equipment leak components according to 40 CFR 63 Subpart H (HON MACT LDAR) would be the applicable BACT. BP will assume that all VOCs are HAPs for determining which components will be part of the HON LDAR program. The use of the single LDAR regulation was concluded to be BACT and will simplify the monitoring program and recordkeeping.

### 3.2.6 40 CFR Part 60, Subpart VVa

The units are not presently subject to this regulation since they were built before the regulatory applicability date and have not been modified as defined in the regulation since the applicability date. This regulation will be applicable to the units since they will be modified as defined in the regulation after the November 6, 2006 applicability date. However, the facility has chosen an alternative means of compliance within the regulation. The facility will comply with Part 63, subpart H. Owners or operators may choose to comply with the provisions of 40 CFR Part 63, Subpart H, to satisfy the requirements of §§ 60.482-1a through 60.487a for an affected facility. When choosing to comply with 40 CFR Part 63, Subpart H, the requirements of § 60.485a (d), (e), and (f), and § 60.486a(i) and (j) still apply.

### 3.2.7 40 CFR Part 60, Subpart III

The #2 OX unit reactor is subject to the NSPS for VOC emissions from SOCMI air oxidation units as set forth in 40 CFR 60, Subpart III. The new #1 OX reactor will also be subject to this regulation. The Subpart III total resource evaluation (TRE) is above four after the last recovery device for both units. There are no requirements for this regulation other than to keep track of potential changes in the TRE per 40 CFR 60.610(c).

### 3.2.8 40 CFR Part 60, Subpart NNN

The #2 OX DHT is presently subject to the NSPS for VOC emissions from SOCM distillation operations as set forth in 40 CFR 60, Subpart NNN. An additional NNN operation (Entrainer Recovery Tower) will be added to the unit with this project. This new distillation tower will vent to the same recovery system as the #2 OX DHT recovery system. The NNN TRE after the last recovery device in the distillation tower vent system will be above eight so there will be no requirements for this regulation other than to keep track of potential changes in the TRE.

The modifications to the #1 OX DHT will cause it to be subject to this regulation. An additional NNN operation (Entrainer Recovery Tower) will be added to the unit with this project. This new distillation tower will vent to the same recovery system as the #1 OX DHT recovery system. The NNN TRE after the last recovery device in the distillation tower vent system will be above eight so there will be no requirements for this regulation other than to keep track of potential changes in the TRE.

### 3.2.9 40 CFR Part 60, Subpart RRR

The regulation specifies that it is applicable to reactors, excluding reactor processes using air as a reactant, that produce one of the chemicals listed in the regulation. However, the PTA unit reactors do not produce a chemical but only purify a chemical produced in the OX unit reactor which is subject to Subpart III.

### 3.2.10 40 CFR Part 60, Subpart YYY

This regulation has been proposed but has not been finalized. When the regulation is finalized, the applicability to the units and the regulatory requirements will have to be assessed at that time.

### 3.2.11 40 CFR Part 60, Subpart IIII

None of the Reciprocating Internal Combustion Engines (RICE) associated with the affected units are subject to this regulation since they were purchased prior to the regulatory applicability date. This project will not add any RICE subject to this regulation.

### 3.2.12 40 CFR Part 61, Subpart M

The facility has asbestos-containing materials (ACM) on the site that must be handled in accordance with this regulation. This project will not change the requirements of this

regulation to the facility. Any ACM that is removed or disturbed during the project will be handled in accordance with this regulation.

#### 3.2.13 40 CFR Part 61, Subpart FF

The total annual benzene (TAB) quantity from facility waste has historically been less than 1 megagrams per year (Mg/yr). This project will not cause the facilities TAB to be greater than 1 Mg/yr. This project will not change the applicable requirements to the facility.

#### 3.2.14 40 CFR Part 63, Subpart A

This regulation is applicable to the unit and provides general requirements for the control of HAPs emissions in various regulations under 40 CFR 63. This project will not change the requirements of this regulation that are applicable to the units.

#### 3.2.15 40 CFR Part 63, Subpart F

This regulation is applicable to the units and provides general requirements for HAP emissions from SOCM sources. This project will not change the requirements of this regulation to the unit.

#### 3.2.16 40 CFR Part 63, Subpart G

The #1 and #2 OX and PTA units are subject to the requirements of Subpart G as set forth in 40 CFR Part 63. These units are subject to the process vent and wastewater provisions of Subpart G with all the existing sources being HON Group 2 sources. BP CR is currently in compliance with all requirements of Subpart G. The modifications to the units will not constitute reconstruction as defined in the MACT regulations since the total cost of the project will be substantially less than the 50 percent replacement cost threshold. Therefore, the #1 units will remain existing sources and the #2 units will continue as new sources.

This project will create some new HON process vents that will also be Group 2 vents and remove some existing HON process vents. This project will also add some new tanks that will all be Group 2 storage tanks.

#### 3.2.17 40 CFR Part 63, Subpart H

The #1 and #2 OX and PTA units are subject to the requirements of Subpart H as set forth in 40 CFR Part 63. BP CR is currently in compliance with all presently applicable requirements of Subpart H. However, based on the BACT determination for fugitives

and in order to simplify the LDAR program BP will expand this regulations' applicability by including all components that meet the 5 percent HAP content requirement for inclusion by considering all VOC as HAPs for the LDAR program determination.

#### 3.2.18 40 CFR Part 63, Subpart EEEE

The regulation would potentially be applicable to some sources at the facility but they are all subject to the HON regulations. Hence, they are all excluded from this regulation and there are no requirements under this regulation.

#### 3.2.19 40 CFR Part 63, Subpart GGGGG

This regulation is applicable to remediation at the site. There is currently no ongoing remediation at the site. However, if any events occur at the site that trigger remediation, the requirements of this regulation will be applied.

#### 3.2.20 40 CFR Part 63, Subpart ZZZZ

The RICEs associated with the units are subject to this regulation. All the subject engines are diesel-powered combustion ignition engines and do not have any applicable emission standards but have work practice standards to meet. This project will not add any new equipment subject to this regulation nor will it revise the requirements for the existing engines.

#### 3.2.21 40 CFR Part 63, Subpart DDDDD

The boilers and #2 OX-HPVGTS heater are subject to the requirements for HAP emissions as set forth in 40 CFR 63, Subpart DDDDD. The Title V renewal application submittal has requested a permit revision to limit the boilers to burning gaseous fuels and would only burn liquid fuel during a gas curtailment or for no more than 48 hours per year for testing. The boilers will meet the requirements for a gas-fired boiler. The #2 HPVGTS heater only burns gas and will meet the requirements for a gas-fired heater. This project will not change the requirements of this regulation to the sources.

#### 3.2.22 40 CFR Part 64

This regulation specifies the requirements for monitoring to assure compliance with emission limits for applicable pollutant specific emission units. The facility has received a Title V renewal permit including required compliance assurance monitoring (CAM) conditions. The present CAM will be revised, as necessary, to reflect the changes in the process flow and control schemes.



# Section 4

## Best Available Control Technology Analysis for Volatile Organic Compound Emissions and Carbon Monoxide

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### 4.1 Control Technology Information

The following is a brief description of each of the control technologies that will be considered in at least one of the BACT analysis to follow. The possible control efficiency for each technology shown in the following descriptions is the upper range for each technology and may not be possible but has been assumed for BACT purposes (*i.e.*, an RTO may not be able to achieve 99 percent in practice).

- n **Thermal Oxidizer (TO)** –A TO is a controlled combustion technology for air pollution control of a gaseous stream. Fuel and air are added to a combustion chamber through which the exhaust gases pass to maintain a high minimum operating temperature and decompose the VOC and CO into carbon dioxide (CO<sub>2</sub>) and water (H<sub>2</sub>O) before releasing them to the atmosphere. This technology has a possible control efficiency of 99 percent for VOC and 95 percent for CO. The operation of a TO will result in an increase in pollutants from natural gas combustion, specifically nitrogen oxides, which is an added environmental impact.
- n **Regenerative Thermal Oxidizer (RTO)** – This control technology is similar to a TO in the manner it controls the VOC and CO emissions. The difference in the RTO versus a TO is the energy efficiency it achieves by storing heat in ceramic media as the process stream enters and exits the combustion chamber. The directions of the airflow is reversed every 1 to 3 minutes by a series of valves to alternately store and regenerate the heat – the inlet process stream gets pre-heated and the outlet process stream gives up the heat. The result is a more energy efficient operation than a TO. This technology has a possible control efficiency of 99 percent for VOC and 95 percent for CO. The operation of a RTO will result in an increase in pollutants from natural gas combustion, specifically nitrogen oxides, which is an added environmental impact.
- n **Recuperative Thermal Oxidizer (RCO)** – This control technology is similar to a TO in the manner it controls the VOC and CO emissions. The difference in the RCO versus a TO is the energy efficiency it achieves by a primary and/or secondary heat exchanger within the system. A primary heat exchanger preheats the incoming vent stream by recuperating heat from the exiting treated stream. As the incoming air passes on one side of the exchanger heat is transferred to it through the process of conduction from the hot clean air from the



combustion chamber passing on the other side of the exchanger. This technology has a possible control efficiency of 99 percent for VOC and 95 percent for CO. The operation of a RCO will result in an increase in pollutants from natural gas combustion, specifically nitrogen oxides, which is an added environmental impact.

- n **Catalytic Thermal Oxidizer (CTO)** – This control technology decomposes the VOC and CO into CO<sub>2</sub> and water at lower temperatures than a TO in the presence of a catalyst to promote the reaction. The lower temperatures will reduce the amount of supplemental heat required for the process and reduce possible natural gas combustion emissions. Catalytic oxidation occurs through a chemical reaction between the VOC hydrocarbon molecules and a precious-metal catalyst bed that is internal to the oxidizer system. A catalyst is a substance that is used to accelerate the rate of a chemical reaction, allowing the reaction to occur in a much lower normal temperature range. This technology has a possible control efficiency of 99 percent for VOC and 95 percent for CO. The operation of a CTO will result in an increase in pollutants from natural gas combustion, specifically nitrogen oxides, which is an added environmental impact. An additional disadvantage is the disposal of the spent catalyst. Depending on the catalyst type, the spent catalyst may require disposal in an approved hazardous waste disposal site.
- n **Flare** – A gas flare, alternatively known as a flare stack, is an open air gas combustion device used for burning off flammable gas that will be released to the atmosphere. The vent stream being treated must contain a minimum British thermal units/standard cubic feet (Btu/scf) value to maintain combustion or a supplemental fuel must be added to meet the minimum. The control requirements in 40 CFR 60.18 states a flare shall only be used as a control device if the vent stream being combusted has a net heating value of at least 200 Btu/scf. This is to prevent very low Btu vent streams from blowing out the flare flame. This technology has a possible control efficiency of 98 percent for VOC. This control technology has a disadvantage of potentially producing as many CO emissions as it would destroy so it may not be a feasible technology for CO control.
- n **Absorber/Scrubber** – Absorber/Scrubber systems are air pollution control devices that can be used to remove some particulates and/or gases from industrial exhaust streams. This process works via the contact of contaminants with the absorbing/scrubbing solution to remove the contaminants from the vent stream. The process uses rapid gas absorption by use of pressure drop and excellent gas and liquid distribution either mechanically or physically to remove the contaminants. Solutions may simply be water (for dust) or solutions of reagents that specifically target certain compounds. Gas enters at the bottom of the absorber and is contacted in a countercurrent fashion in the absorption section by the scrubbing liquid that is sprayed into the top of the scrubber. The gas stream passes upward in the tower through a mist eliminator where entrained droplets are removed before the exhaust gas enters the stack. The scrubber solution is collected in the bottom of the tower where most of the scrubbing solution is recycled to the top of the tower. A small amount of scrubber solution is bled to remove the scrubbed VOC and to allow for the

addition of fresh scrubbing liquid. This technology has a possible control efficiency of 95 percent for VOC but will not control CO emissions. The operation of an absorber/scrubber will result in an increase of a spent scrubbing solution that must be treated before being disposed.

- n **Adsorber** – An adsorber removes contaminants by adsorbing them onto a solid material, such as activated carbon, that has a high surface area and is used to capture a gas or liquid. The adsorbed material can then be removed by steam or combustion and the carbon reused. This technology has a possible control efficiency of 98 percent for VOC but will not control CO emissions. The operation of an absorber/scrubber will result in an increase of a solid waste (spent carbon) that must be treated before being disposed
- n **Condenser** – A condenser is a device or unit used to condense a substance from its gaseous to its liquid state, typically by cooling it. In so doing, the latent heat is given up by the substance, and will transfer to the condenser coolant. Condensers are typically heat exchangers which have various designs and come in many sizes ranging from rather small (hand-held) to very large industrial-scale units used in plant processes. The condensed liquid can be recovered or recycled. This technology has a possible control efficiency of range of 50 to 90 percent for VOC depending on the concentration and VOC compounds present in the stream but will not control CO emissions.

## 4.2 Best Available Control Technology Analysis for Volatile Organic Compound Emissions from Low Pressure Absorbers

The OX unit LPA is a recovery device for several process streams in the unit. The LPA recovers the acetic acid in the inlet streams and recycles it into to the process so it eventually reaches the reactor system. This is a valuable material that acts as the solvent for the process and any loss from the LPA outlet must be replaced by purchase of fresh acetic acid. Part of the optimization of the manufacturing process is to minimize the loss of acetic acid.

This project plans to remove the compressor on the DHT overhead stream (LPVGT) and route the DHT overhead through an acetic acid scrubber and then to the LPA. The LPA operates at about 5 inches water (H<sub>2</sub>O) pressure and is estimated to recover over \$1,000,000 per year of valuable process solvents.

The PTE VOC emissions from the LPA will be 42.0 tpy for #1 OX LPA and 38.8tpy for #2 OX LPA. The LPA outlet stream will require a fan to raise the pressure sufficiently to allow the stream to go to a control device. This analysis will be based on add-on controls to the outlet of the LPA recovery device.

#### 4.2.1 Identification of Control Technologies

The reasonably available control technology (RACT), BACT, LAER Clearinghouse (RBLC) database was queried for emission sources and control devices of VOC that are used in the process types 64.000, 64.003 and 64.999, SOCFI production. The results of the RBLC search are shown in Appendix C. The search returned several facilities and processes for BACT in these industrial categories. The following control devices were identified from the search as potential add-on controls to the LPA outlet:

- Absorber/Scrubber
- Condenser
- Flare
- TO
- RTO

In the RBLC, no control devices were found to apply directly to the PTA manufacturing process.

Other resources of control technology were reviewed, such as *EPA Air Pollution Control Technology Fact Sheets*; *EPA Air Pollution Control Cost Manual Sixth Edition*, EPA/452/B-02-001, January 2002; and the applicable NSPS and NESHAP standards. The results of this review indicated that the following control equipment may be effective in the reduction of VOCs:

- Adsorber
- RCO
- CT

A BACT analysis was performed for each of the control equipment options. The processes currently do not have any add-on controls after the LPA.

#### 4.2.2 Elimination of Infeasible Control Options

Seven control options were evaluated qualitatively to determine if these options are technically feasible. The following control technologies were all determined to be technically feasible for control of VOC:

1. TO
2. RTO
3. RCO
4. CTO
5. Absorber/Scrubber
6. Adsorber

7. Condenser
8. Flare

While the above technologies are all technically feasible, they will require the additional equipment to raise the pressure on the LPA outlet to allow it to flow through any of these control devices. The installation of the additional equipment to increase the pressure of the process stream (*i.e.*, fan/blower) to allow it to flow through a control device will in turn increase the capital cost for the proposed configuration. Also any VOC or organics recovered/ captured would not be able to be recycled to the process since the materials would be contaminants for the process and be detrimental to the operation. Therefore, additional equipment will be required to treat the recovered material. The addition of an absorber/wet scrubber to the outlet of the LPA while being feasible will have much lower removal efficiency than a normal scrubber since the stream is already being treated in the LPA which is a two-stage absorber system.

A detailed economic analysis of the technically feasible options has been performed and is summarized in the following subsections.

#### 4.2.3 Ranking of Remaining Control Technologies

The potential effectiveness of the remaining control options has been evaluated by reviewing manufacturer information and United States Environmental Protection Agency (USEPA) documents. The remaining control options and their associated anticipated efficiencies are listed below:

CONTROL OPTION	EFFICIENCY (%)
TO	99
CTO	99
RTO	99
RCO	99
Carbon Adsorption/TO	98
Flare	98
Refrigerated Condenser	55
Absorber/Scrubber	50

#### 4.2.4 Evaluation of Most Effective Control Technologies and Selection of Best Available Control Technology

The BACT analysis is a three-part investigation that includes economic, energy, and environmental impacts. Each of the remaining options was reviewed with respect to the impacts to determine if they meet BACT requirements.

##### *Economic Analysis*

The economic analysis is composed of a calculation of the control technologies' average cost effectiveness (ACE) based on a comparison of the cost of each feasible control technology in terms of cost per mass of pollutant removed. In general, technologies with excessive costs per ton of pollutant removed are considered excessive in most cases and the installation of that technology would not be deemed economically feasible.

The ACE was determined by estimating the capital cost for an installed system and the resulting annual operating and maintenance costs. The capital and operating expenses were obtained from using the *EPA Air Pollution Control Cost Manual Sixth Edition*, EPA/452/B-02-001 or *EPA's Air Pollution Control Fact Sheets*. The ACE is estimated according to the following formula:

$$\text{ACE} = (\text{Control Option Annualized Cost}) / (\text{Baseline emission rate} - \text{Control option emission rate})$$

The baseline VOC emissions from #1 OX LPA are estimated at 42.0 tpy and #2 OX LPA as 38.8 tpy. The #1 OX LPA emission rate was used as the baseline emission rate for the BACT analysis. This emission rate is used to determine the ACE for each specific control option. This emission rate would be representative for both #1 OX LPA and #2 OX LPA since the ratio of the flow rate impact on equipment costs and emission rates were both about 92 percent. Since the #1 emission rate is higher it would give the lowest ACE values for determining if any of the control technologies were economically feasible.

The ACE can be estimated from the capital and annual operating costs by annualizing the capital cost (multiplying by a factor of 0.10 to simulate a 20-year equipment life and an 8 percent interest rate). This value is added to the annual operating cost and the sum is divided by the product of the control efficiency and the uncontrolled emission rate. As an example ACE calculation, assume the control efficiency of an option is 99 percent. The (baseline emission rate-control option emission rate) for each option is equal to {42.0 tpy – [42.0 tpy

X (1-99%)]} or 41.6 tons on an annual basis. This emission rate is used to determine the ACE for the specific control option.

Table 4-1 provides a summary of the annualized operating cost and average cost effectiveness for each of the control options. The cost analysis information is provided in Appendix D, BACT Analysis Cost Information.

Table 4-1  
LPA VOC BACT Analysis

CONTROL OPTION	EMISSION REDUCTION (tpy)	TOTAL CAPITAL COST (\$)	ANNUALIZED OPERATING COST (\$)	AVERAGE COST EFFECTIVENESS (\$/ton)	INCREASED ENERGY USAGE (\$/yr)	ADVERSE ENVIRONMENTAL IMPACTS?
TO	41.6	\$1,070,7562	\$478,978	\$11,506	\$249,1272	Yes
CTO	41.6	1,464,014	394,328	9,472	100,324	Yes
RTO	41.6	1,179,994	365,915	8,790	105,751	Yes
RCO	41.6	1,660,644	518,557	12,456	110,983	Yes
Carbon Adsorber/TO	41.2	1,247,886	509,141	12,355	14,811	Yes
Flare	41.2	643,438	2,454,509	59,565	2,072,818	Yes
Refrigerated Condenser	23.1	764,251	360,665	15,528	17,050	Yes
Absorber/Scrubber	21.0	637,990	421,904	20,067	3,789	Yes

The ACE value for the options discussed above are high enough per ton of VOC removed, to not be economically feasible. A comparison to recent South Carolina PSD permit application for AGY-Aiken, LLC shows that ACE values in the range of \$5,760 to \$9,031 were deemed not cost effective for control of VOC. The options with the lowest ACE are a CTO or a RTO. However, the use of an RTO for a stream containing a halogen compound (methyl bromide) is not recommended because of the formation of highly corrosive acid gases per USEPA technology fact sheets (see Appendix H). The only remaining potentially feasible option is a CTO which has the lowest ACE value. The energy and environmental factors need to be considered for the CTO option to determine the appropriate BACT technology.

### *Energy Analysis*

An energy impact analysis is used to identify if the technically feasible control options result in any significant or unusual energy penalties or benefits. The feasible control options have been evaluated and it has been determined that no unusual energy penalties exist beyond what was considered in the economic analysis described in the previous section. Each of the combustion options will require a substantial amount of increased fuel gas consumption. The carbon adsorption will require additional fuel to produce the regeneration steam and the natural gas for the combustion device to control the VOC emissions during the regeneration. An analysis of energy benefits was also considered; the various options do not result in any energy benefit for the BP facility.

### *Environmental Analysis*

A review of the control options with respect to the environment was conducted to determine if any of the options created any adverse environmental impacts. The TO, RTO, RCO, and CTO control options results in significant increases in energy usage from powering fans with electricity to heating the vent streams with natural gas. The scrubber option generates a large volume of wastewater that would need to be treated. Thermal options (TO, RTO, and RCO) will also generate more products of combustion such as greenhouse gases (GHG), CO, and NO<sub>x</sub> that make these control options less environmentally beneficial. The CTO option will generate more GHG and NO<sub>x</sub> making it a poor choice for BACT considering the ACE for this option is high. The condenser option will create a large volume of liquid waste that will need to be treated prior to discharge. The proposed technically feasible options are not environmentally



beneficial and in all cases create byproducts such as wastewater and secondary air emissions.

#### 4.2.5 Selection of Best Available Control Technology

Based on the economic, energy, and environmental impacts associated with the technically feasible control options, BP has concluded that the proper operation of the LPA recovery system is BACT and no add-on control technology to the LPA outlet is justified. BP proposes a BACT limit for VOC emissions from the #1 OX LPA of 42.0 tpy (12 lbs/hr) and #2 OX LPA of 38.8 tpy (11 lbs/hr) on a rolling 12-month sum. This process vent will be subject to CAM monitoring and will be monitored in accordance with the existing CAM plan to demonstrate compliance with the BACT limits. The details of the monitoring are listed in Subsection 2.5 of this application. If performance testing is required the VOC emissions will be determined every 36 months in accordance with either Method 18 or 25A.

### 4.3 Best Available Control Technology Analysis for Volatile Organic Compound Emissions from High Pressure Absorbers

The OX unit reactor temperature is controlled by boiling off some of the liquid in the reactor. This vapor stream goes through several stages of condensing, with the condensed liquid being returned to the reactor, before the reactor overhead is sent to the recovery system. This recovery system consists of an acetic acid scrubber and then the HPA. This analysis will be based on add-on controls to the outlet of the HPA recovery device.

Presently the outlet of the HPA is sent to the HPVGTS where the pollutants (VOC, CO, and HAPs) are controlled in a catalytic oxidation reactor and a bromine scrubber before the stream is exhausted to either the inert gas system for use as a carrier gas for the conveying system or the expander for power recovery prior to being exhausted to the atmosphere. Any control option must include a bromine scrubber to comply with the Montreal Protocol agreement on methyl bromide emissions. The carrier gas for the conveying system must not contain over 5 percent oxygen to avoid explosive conditions in silos with the PTA dust. Therefore, any thermal control technology that requires additional air for the control option would have to provide an alternative inert carrier gas (e.g., nitrogen).

The PTE VOC emissions from the HPA will be 1,025.0 tpy for #1 OX HPA and 765.0 tpy for #2 OX HPA.

#### 4.3.1 Identification of Control Technologies

The RBLC database was queried for emission sources and control devices of VOC that are used in the process type Process Vents (emissions from air OX, distillation, and other reaction vessels), Organic Chemical production. The results of the RBLC search are shown in Appendix C. The search returned nine facilities and 33 processes for BACT in this industrial category. The following control devices were identified from the search:

- Absorber/Wet Scrubber
- TO
- Flare
- Condenser
- RTO

No control devices were found to apply directly to the PTA manufacturing process.

Other resources of control technology were reviewed, such as *EPA Air Pollution Control Technology Fact Sheets*; *EPA Air Pollution Control Cost Manual Sixth Edition*, EPA/452/B-02-001, January 2002; and the applicable NSPS and NESHAPs standards. The results of this review indicated that the following control equipment may be effective in the reduction of VOCs:

- Adsorber
- CTO
- RCO

A BACT analysis was performed for each of the control equipment options. The processes currently utilize a CTO as the add-on control device.

#### 4.3.2 Elimination of Infeasible Control Options

The control options were evaluated qualitatively to determine if these options are technically feasible. The following control technologies were all determined to be technically feasible for control of VOC:

1. Absorber/Wet Scrubber
2. Adsorber
3. TO
4. RTO
5. RCO
6. CTO (existing HPVGTS)
7. Condenser

The use of a Flare was found to be technically infeasible since as discussed above the outlet of the control device would need to go to a bromine scrubber to remove the halogens per the Montreal Protocol agreement. Sources controlled by flares are not amenable to post-flare control. Since a scrubber cannot be added to the flare outlet, this control option is technically infeasible. The addition of an absorber/wet scrubber to the outlet of the HPA while being feasible will have much lower removal efficiency than a normal scrubber since the stream is already being treated in a two-stage absorber system that has already removed most of the pollutants.

A detailed economic analysis of the technically feasible options has been performed and is summarized in the following subsections.

#### 4.3.3 Ranking of Remaining Control Technologies

The potential effectiveness of the remaining control options has been evaluated by reviewing manufacturer information and USEPA documents. The remaining control options and their associated anticipated efficiencies are listed below:

CONTROL OPTION	EFFICIENCY (%)
TO/Bromine Scrubber	99
RTO/Bromine Scrubber	99
RCO/Bromine Scrubber	99
CTO (Existing HPVGTs with Bromine Scrubber)	98
Carbon Adsorption/TO/Bromine Scrubber	98
Refrigerated Condenser/Bromine Scrubber	90
Scrubber/Absorber	55

#### 4.3.4 Evaluation of Most Effective Control Technologies and Selection of Best Available Control Technology

The BACT analysis is a three-part investigation that includes economic, energy, and environmental impacts. Each of the options was reviewed with respect to the impacts to determine if they meet BACT requirements.

##### *Economic Analysis*

The economic analysis is composed of a calculation of the control technologies' ACE based on a comparison of the cost of each feasible control technology in terms of cost per mass of pollutant removed. In general, technologies with

excessive costs per ton of pollutant removed are considered excessive in most cases and the installation of that technology would not be deemed economically feasible.

The ACE was determined by estimating the capital cost for an installed system and the resulting annual operating and maintenance costs. The capital and operating expenses were obtained from the *EPA Air Pollution Control Cost Manual Sixth Edition*, EPA/452/B-02-001 or *EPA's Air Pollution Control Fact Sheets*. The ACE is estimated according to the following formula:

$$\text{ACE} = (\text{Control Option Annualized Cost}) / (\text{Baseline emission rate} - \text{Control option emission rate})$$

The #1 OX baseline emissions are estimated at 1,025.0 tpy. This emission rate was used as the baseline emission rate for the BACT analysis. This emission rate is used to determine the ACE for the specific control option. The #1 OX emissions would give the worst case answer since the equipment cost ratio based on relative flow rates would be about 90 percent but the #2 emission rate is only about 75 percent. Therefore the ACE for the #2 OX case would be higher for a comparable control option.

The ACE can be estimated from the above capital and annual operating costs by annualizing the capital cost (multiplying by a factor of 0.10 to simulate a 20-year equipment life and an 8 percent interest rate). This value is added to the annual operating cost and the sum is divided by the product of the control efficiency and the uncontrolled emission rate. Table 4-2 provides a summary of the annualized cost and ACE values for each of the control options. The cost analysis information is provided in Appendix D, BACT Analysis Cost Information.

The TO, RTO, and RCO options are not cost effective based on a comparison to recent South Carolina PSD permit application for AGY-Aiken, LLC that indicated that ACE values in the range of \$5,760 to \$9,031 were deemed not cost effective for control of VOC. The ACE value for the CTO (existing HPVGTS with existing bromine scrubber) is the highest efficiency control option with an economically feasible control cost. Therefore the existing control option meets the criteria for BACT.

Table 4-2  
HPA VOC BACT Analysis

CONTROL OPTION	EMISSION REDUCTION (tpy)	TOTAL CAPITAL COST (\$)	ANNUALIZED OPERATING COST (\$)	AVERAGE COST EFFECTIVENESS (\$/ton)	INCREASED ENERGY USAGE (\$/yr)	ADVERSE ENVIRONMENTAL IMPACTS?
TO/Bromine Scrubber	1,014.7	\$2,512,7044	\$29,543,821	\$29,117	11,306,341	Yes
RTO/Bromine Scrubber	1,014.7	5,530,255	19,689,949	19,405	1,002,328	Yes
RCO/Bromine Scrubber	1,014.7	3,331,993	29,079,323	28,659	5,563,302	Yes
CTO (Existing HPVGTS with Bromine Scrubber)	1,004.4	0	806,690	803	0	Yes
Carbon Adsorption/TO/ Bromine Scrubber	1,004.4	2,321,727	4,747,662	4,727	28,257	Yes
Scrubber/Absorber	563.8	2,860,342	2,003,871	3,555	0	Yes
Refrigerated Condenser/ Bromine Scrubber	922.4	2,990,787	1,129,548	1,225	0	Yes

### *Energy Analysis*

An energy impact analysis is used to identify if the technically feasible control options result in any significant or unusual energy penalties or benefits. The feasible control options have been evaluated and it has been determined that no unusual energy penalties exist beyond what was considered in the economic analysis described in the previous section. Each of the combustion options will require a substantial amount of increased fuel gas consumption. The carbon adsorption will require additional fuel to produce the regeneration steam and the natural gas for the combustion device to control the VOC emissions during the regeneration. An analysis of energy benefits was also considered; the various options do not result in any energy benefit for the BP facility.

### *Environmental Analysis*

A review of the control options with respect to the environment was conducted to determine if any of the options created any adverse environmental impacts. The TO, RTO, and RCO control options results in significant increases in energy usage from powering fans with electricity to heating the vent stream with natural gas. The scrubber option generates a large volume of wastewater that that must be treated. Thermal options (TO, RTO, and RCO) will also generate more products of combustion such as GHG, CO, and NO<sub>x</sub> that make these control options less environmentally beneficial. The condenser option will create a large volume of liquid waste that will need to be treated prior to discharge. The proposed technically feasible options are not environmentally beneficial and in all cases create byproducts such as wastewater and secondary air emissions.

#### **4.3.5 Selection of Best Available Control Technology**

Based on the energy, environmental, and economic impacts associated with the technically feasible control options, BP has concluded that the CTO (existing HPVGTS with bromine scrubber) is the highest control efficiency option that is economically feasible. Therefore the CTO (existing HPVGTS with bromine scrubber) control option meets the criteria for BACT. BP proposes a BACT limit for VOC emissions from the #1 HPVGTS of 20.5 tpy (6 lbs/hr) and #2 HPVGTS of 15.3 tpy (5 lbs/hr) on a rolling 12-month sum. These process vents are subject to CAM requirements and will be monitored in accordance with the existing CAM plan to demonstrate compliance with the BACT limit. The details of the monitoring are listed in Subsection 2.5 of this

application. If performance testing is required the VOC emissions will be determined every 36 months in accordance with either Method 18 or Method 25A.

#### 4.4 Best Available Control Technology Analysis for Volatile Organic Compound Emissions from Crystallizer Vent Scrubbers

The temperature of the PTA crystallizers is controlled by flashing off some of the liquid in the crystallizer. This vapor stream is routed to the PTA Crystallizer Vent Scrubber where the stream is scrubbed with water to remove the entrained PM, which is mostly PTA product. The scrubbing water containing the PM is sent to the PTA feed drum for slurring the TA feed and to recycle the PTA recovered in the Vent Scrubber.

The scrubbed vapor from the Crystallizer Vent Scrubber, which is about 99 percent steam, is emitted to the atmosphere and contains about 46.5 tpy of VOC in #1 and #2 PTA Crystallizer Vent Scrubbers. The VOC emitted from the vent scrubber is material entrained in the TA feed to the PTA section.

##### 4.4.1 Identification of Control Technologies

The RBLC database was queried for emission sources and control devices of VOC that are used in the process type Process Vents (emissions from air OX, distillation, and other reaction vessels), Organic Chemical production. The results of the RBLC search are shown in Appendix C. The search returned nine facilities and 33 processes for BACT in this industrial category. The following control device was identified from the search:

- |                         |             |
|-------------------------|-------------|
| – Absorber/Wet Scrubber | – Condenser |
| – TO                    | – RTO       |
| – Flare                 |             |

No control devices were found to apply directly to the PTA manufacturing process.

Other resources of control technology were reviewed, such as *EPA Air Pollution Control Technology Fact Sheets*; *EPA Air Pollution Control Cost Manual Sixth Edition*, EPA/452/B-02-001, January 2002; and the applicable NSPS and NESHAP standards. The results of this review indicated that the following control equipment may be effective in the reduction of VOCs:

- |            |       |
|------------|-------|
| – Adsorber | – CTO |
| – RCO      |       |

A BACT analysis was performed for each of the control equipment options. The processes currently do not have any add-on controls to the PTA crystallizer emissions.

#### 4.4.2 Elimination of Infeasible Control Options

The control options were evaluated qualitatively to determine if these options are technically feasible. The following control technologies were determined to be technically feasible for control of VOC:

1. Absorber/Scrubber
2. TO
3. CTO
4. RTO
5. RCO
6. Condenser

The use of a Flare was found to be technically infeasible since the use on a high volume stream that is over 99 percent steam with a heating value of less than 1 Btu/scf is not feasible.

The use of carbon adsorption is not technically feasible because of the high moisture content, over 99 percent, of the stream from the crystallizer scrubber. At moisture contents over 50 percent, water molecules begin to compete with the hydrocarbon for active adsorption sites which significantly lowers the efficiency and capacity of the system.

A detailed economic analysis of the remaining technically feasible options has been performed and is summarized in the following subsections.

#### 4.4.3 Ranking of Remaining Control Technologies

The potential effectiveness of the remaining control options has been evaluated by reviewing manufacturer information and USEPA documents. The remaining control options and their associated anticipated efficiencies are listed below:

CONTROL OPTION	EFFICIENCY (%)
TO	99
CTO	99
RTO	99



CONTROL OPTION	EFFICIENCY (%)
RCO	99
Scrubber	95
Condenser	70

#### 4.4.4 Evaluation of Most Effective Control Technologies and Selection of Best Available Control Technology

The BACT analysis is a three-part investigation that includes economic, energy, and environmental impacts. Each of the remaining options was reviewed with respect to the impacts to determine if they meet BACT requirements.

##### *Economic Analysis*

The economic analysis is composed of a calculation of the control technologies' ACE based on a comparison of the cost of each feasible control technology in terms of cost per mass of pollutant removed. In general, technologies with excessive costs per ton of pollutant removed are considered excessive in most cases and the installation of that technology would not be deemed economically feasible.

The ACE was determined by estimating the capital cost for an installed system and the resulting annual operating and maintenance costs. The capital and operating expenses were obtained from the *EPA Air Pollution Control Cost Manual Sixth Edition*, EPA/452/B-02-001 or *EPA's Air Pollution Control Fact Sheets*. The ACE is estimated according to the following formula:

$$\text{ACE} = (\text{Control Option Annualized Cost}) / (\text{Baseline emission rate} - \text{Control option emission rate})$$

The baseline emissions are estimated at 46.5 tpy for the #2 PTA crystallizer vent scrubber emissions. The #2 PTA emission rate was used as the baseline emission rate for the BACT analysis. This emission rate is used to determine the ACE for the specific control option. The #2 emission rate would give the worst case answer since the equipment cost ratio based on relative flow rates would be over 100 percent but the #1 emission rate is only about 56 percent. Therefore the ACE for the #2 OX case would be higher for a comparable control option. Table 4-3 provides a summary the annualized cost and ACE values for each of the control options. The cost analysis information is provided in Appendix D, BACT Analysis Cost Information.

Table 4-3  
Crystallizer Scrubber VOC BACT Analysis

CONTROL OPTION	EMISSION REDUCTION (tpy)	TOTAL CAPITAL COST (\$)	ANNUALIZED OPERATING COST (\$)	AVERAGE COST EFFECTIVENESS (\$/ton)	INCREASED ENERGY USAGE (\$/yr)	ADVERSE ENVIRONMENTAL IMPACTS?
TO	46.0	\$1,322,004	\$1,248,118	\$27,113	\$982,627	Yes
CTO	46.0	2,414,389	1,052,109	22,855	627,544	Yes
RTO	46.0	1,453,090	711,415	15,454	410,012	Yes
RCO	46.0	2,326,998	1,367,493	29,707	933,265	Yes
Scrubber	44.2	1,702,867	572,957	12,971	3,800	Yes
Condenser	32.6	753,259	359,105	11,033	17,050	Yes

A comparison to recent South Carolina PSD permit application for AGY-Aiken, LLC shows that ACE values in the range of \$5,760 to \$9,031 were deemed not cost effective for control of VOC. Since the ACE value for the options are all very high per ton of VOC removed, these are not economically feasible.

### *Energy Analysis*

An energy impact analysis is used to identify if the technically feasible control options result in any significant or unusual energy penalties or benefits. The feasible control options have been evaluated and it has been determined that no unusual energy penalties exist beyond what was considered in the economic analysis described in the previous section. The remaining options do not appear to have any significant energy savings that have not already been considered as part of the economic analysis.

### *Environmental Analysis*

A review of the control options with respect to the environment was conducted to determine if any of the options created any adverse environmental impacts. Each of the control options results in significant increases in energy usage from powering fans with electricity to heating vent streams with natural gas. The scrubber and condenser options will generate large quantities of wastewaters that will need to be treated in the wastewater plant. Thermal options (TO, RTO, and RCO) will also generate significant quantities of products of combustion such as GHG, CO, and NOX that make these control options less environmentally beneficial. The results of those analyses are combined with this analysis to select the best control option.

#### **4.4.5 Selection of Best Available Control Technology**

Based on the energy, environmental, and economic impacts associated with the technically feasible control options, BP has determined that none of the technically feasible control options is BACT. BACT for this emission source would be no further control. BP proposes a BACT limit for VOC emissions from the #1 PTA Crystallizer Vent Scrubber of 46.5 tpy (13 lbs/hr) and #2 PTA Crystallizer Vent Scrubber of 46.5 tpy (13 lbs/hr) on a rolling 12-month sum. This limit would be monitored by a specialized performance test, using methodology negotiated with the agency, on this steam stream once every 5 years.

## 4.5 Best Available Control Technology Analysis for Volatile Organic Compound Emissions from Oxidation Unit Fugitives

The OX Units equipment has fluids that contain VOCs which can have fugitive emissions from valves, flanges, drains, vents, pumps, relief valves and other equipment. The PTA Units do not have VOC-containing process streams.

Presently, the OX units have several LDAR programs to minimize the fugitive emissions. The LDAR programs include components subject to NSPS VV, HON and a program similar to NSPS VV. The estimated PTE emissions from the oxidation unit equipment fugitive points after the project with the present LDAR monitoring programs and before considering the impact of BACT is 193.1 tpy of VOC.

### 4.5.1 Identification of Control Technologies

The RBLC database was queried for emission sources and control devices of VOC that are used in the process type Equipment Leaks, Organic Chemical production. The search returned 12 facilities and 23 processes for BACT in this industrial category. The following control device was the only one identified from the search:

- LDAR Program

Other resources of control technology were reviewed, such as *EPA Air Pollution Control Technology Fact Sheets*; *EPA Air Pollution Control Cost Manual Sixth Edition*, EPA/452/B-02-001, January 2002; and NSPS and NESHAPs standards. The results of this review did not find any additional control options applicable to this emission source.

A BACT analysis was performed for this option including an upgrade of the present LDAR program.

### 4.5.2 Elimination of Infeasible Control Options

The control options were evaluated qualitatively to determine if these options are technically feasible. An upgrade of the existing program for components subject to NSPS VV or a similar program to either an NSPS VVa or a HON LDAR program was determined to be technically feasible.

A detailed economic analysis of the different possible LDAR program upgrades has been performed and is summarized in the following subsections.

#### 4.5.3 Ranking of Remaining Control Technologies

The potential effectiveness of the remaining control options has been evaluated by reviewing USEPA documents. The remaining control options and their associated anticipated effectiveness factors for a couple of different components are shown below as a comparison of relative efficiency:

CONTROL OPTION	LIQUID VALVE EFFECTIVENESS FACTOR (%)	LIGHT LIQUID PUMPS EFFECTIVENESS FACTOR (%)
HON MACT LDAR Program	88	75
NSPS VVa LDAR Program	88	71
LDAR VV Program (existing)	61	69

#### 4.5.4 Evaluation of Most Effective Control Technologies and Selection of Best Available Control Technology

The BACT analysis is a three-part investigation that includes economic, energy, and environmental impacts. Each of the remaining options was reviewed with respect to the impacts to determine if they meet BACT requirements.

##### *Economic Analysis*

The economic analysis is composed of a calculation of the control technologies' ACE based on a comparison of the cost of each feasible control technology in terms of cost per mass of pollutant removed. In general, technologies with excessive costs per ton of pollutant removed are considered excessive in most cases and the installation of that technology would not be deemed economically feasible.

The ACE was determined by estimating the resulting annual operating and maintenance costs. The operating expenses were based on historical costs for the existing BP CR LDAR program. The ACE is estimated according to the following formula:

$$\text{ACE} = (\text{Control Option Annualized Cost}) / (\text{Baseline emission rate} - \text{Control option emission rate})$$

The baseline emissions for the existing LDAR program for both #1 and #2 Units combined are estimated and reported as 193.1 tpy. This emission rate was used as the baseline emission rate for the BACT analysis. This emission rate is used to determine the ACE for the specific control option. Table 4-4 provides a

summary of the annualized cost, and the ACE values for each of the control options. The cost analysis information is provided in Appendix D, BACT Analysis Cost Information.

Table 4-4  
Fugitives VOC BACT Analysis

CONTROL OPTION	EMISSION REDUCTION (tpy)	ANNUALIZED OPERATING COST (\$)	AVERAGE COST EFFECTIVENESS (\$/TON)
Upgrade NSPS VV to HON	146.0	\$72,600	\$497
Upgrade NSPS VV to VVa	46.4	59,640	1,285

Since the ACE value for each of the options is low per ton of VOC removed, these options are both economically feasible.

### *Energy Analysis*

An energy impact analysis is used to identify if the technically feasible control options result in any significant or unusual energy penalties or benefits. The feasible control options have been evaluated and it has been determined that no unusual energy penalties or benefits exist beyond what was considered in the economic analysis described in the previous section.

### *Environmental Analysis*

A review of the control options with respect to the environment was conducted to determine if any of the options created any adverse environmental impacts. The control options do not create any adverse environmental impacts.

#### 4.5.5 Selection of Best Available Control Technology

Based on the energy, environmental and economic impacts associated with the technically feasible control options, BP has concluded that upgrading the existing LDAR program by considering all VOCs as HAPs and using the HON LDAR program for the applicable components would be BACT. BP CR will upgrade the LDAR program for the #1 and #2 units. These emissions will be monitored by the HON LDAR requirements and reported per the HON reporting to demonstrate compliance with BACT.

## 4.6 Best Available Control Technology Analysis for Carbon Monoxide Emissions from Low Pressure Absorbers

The OX Unit LPA is a recovery device for several process streams in the unit. The LPA recovers the acetic acid in the inlet streams and recycles it into the process so it eventually reaches the reactor system. This is a valuable material that acts as the solvent for the process and any loss from the LPA outlet must be replaced by purchase of fresh acetic acid. Part of the optimization of the manufacturing process is to minimize the loss of acetic acid. The CO is produced in the reactor by unwanted “acid burning” which causes the loss of the valuable acetic acid that must be replaced and the diversion of the oxygen from the desired reaction to produce TA. The LPA does not recover any of the CO which is a contaminant and diluent for the process and would adversely impact the process if recycled to the unit. This analysis will be based on add-on controls to the outlet of the LPA recovery device.

The PTE of CO emissions from the LPA will be about 18.0 tpy for #1 OX LPA and 15.2 tpy for #2 OX LPA. The LPA outlet stream will require a fan to raise the pressure sufficiently to allow the stream to go to a control device.

### 4.6.1 Identification of Control Technologies

The RBLC database was queried for emission sources and control devices of CO that are used in the process types 64.000, 64.003 and 64.999, SOCMi production. The results of the RBLC search are shown in Appendix C. The search returned seven facilities and nine processes for BACT in these industrial categories. The following control devices were identified from the search:

- CTO
- Good Combustion

In the RBLC, no control devices were found to apply directly to the PTA manufacturing process.

Other resources of control technology were reviewed, such as *EPA Air Pollution Control Technology Fact Sheets*; *EPA Air Pollution Control Cost Manual Sixth Edition*, EPA/452/B-02-001, January 2002; and NSPS and NESHAPs standards. The review indicated that control equipment is typically not employed to reduce CO emissions. The results of this review indicated that the following control equipment may be effective in the reduction of CO:

- TO
- RTO
- RCO
- Flare

#### 4.6.2 Elimination of Infeasible Control Options

Seven control options were evaluated qualitatively to determine if these options are technically feasible. The following control technologies were determined to be technically feasible for control of CO:

1. TO
2. RTO
3. RCO
4. CTO

Since the OX LPA is not a combustion process, the good combustion practices control option is not feasible. The Flare is not a feasible option since the emissions factors for CO emissions from a flare in AP-42 (Table 13.5-1) would indicate that more CO would be created from the combustion of all the required supplemental natural gas than would be removed. A detailed economic analysis of the remaining technically feasible options has been performed and is summarized in the following subsections.

#### 4.6.3 Ranking of Remaining Control Technologies

The potential effectiveness of the remaining control options has been evaluated by reviewing manufacturer information and USEPA documents. The remaining control options and their associated anticipated efficiencies are listed below:

CONTROL OPTION	EFFICIENCY (%)
TO	95
CTO	95
RTO	95
RCO	95

#### 4.6.4 Evaluation of Most Effective Control Technologies and Selection of Best Available Control Technology

The BACT analysis is a three-part investigation that includes economic, energy, and environmental impacts. Each of the remaining options was reviewed with respect to the impacts to determine if they meet BACT requirements.



### *Economic Analysis*

The economic analysis is composed of a calculation of the control technologies' ACE based on a comparison of the cost of each feasible control technology in terms of cost per mass of pollutant removed. In general, technologies with excessive costs per ton of pollutant removed are considered excessive in most cases and the installation of that technology would not be deemed economically feasible.

The ACE was determined by estimating the capital cost for an installed system and the resulting annual operating and maintenance costs. The capital and operating expenses were obtained from using the *EPA Air Pollution Control Cost Manual Sixth Edition*, EPA/452/B-02-001 or *EPA's Air Pollution Control Fact Sheets*. The ACE is estimated according to the following formula:

$$\text{ACE} = (\text{Control Option Annualized Cost}) / (\text{Baseline emission rate} - \text{Control option emission rate})$$

The baseline emissions from #1 OX LPA are estimated at 18.0 tpy. The #1 OX LPA emission rate was used as the baseline emission rate for the BACT analysis. This emission rate is used to determine the ACE for the specific control option. This would be the worst case since the #2 to #1 ratio of the flow rate impact on equipment costs would be about 92 percent and emission rate ratio would only be about 85 percent. As an example ACE calculation, assume the control efficiency of an option is 95 percent. The (baseline emission rate - control option emission rate) for each option is equal to {18.0 tpy - [18.0 tpy X (1-95%)]} or 17.1 tons on an annual basis. This emission rate is used to determine the ACE for the specific control option.

The ACE can be estimated from the above capital and annual operating costs by annualizing the capital cost (multiplying by a factor of 0.10 to simulate a 20-year equipment life and an 8 percent interest rate). This value is added to the annual operating cost and the sum is divided by the product of the control efficiency and the uncontrolled emission rate. Table 4-5 provides a summary of the annualized cost and ACE values for each of the control options. The cost analysis information is provided in Appendix D, BACT Analysis Cost Information.

Table 4-5  
LPA CO BACT Analysis

CONTROL OPTION	EMISSION REDUCTION (tpy)	TOTAL CAPITAL COST (\$)	ANNUALIZED OPERATING COST (\$)	AVERAGE COST EFFECTIVENESS (\$/ton)	INCREASED ENERGY USAGE (\$/yr)	ADVERSE ENVIRONMENTAL IMPACTS?
TO	17.1	\$1,070,756	\$478,978	\$28,010	\$249,127	Yes
CTO	17.1	1,464,014	394,328	23,060	100,324	Yes
RTO	17.1	1,179,994	365,915	21,399	105,751	Yes
RCO	17.1	1,660,644	518,557	30,325	110,983	Yes

Since the ACE value for the options are all very high per ton of CO removed, these are not economically feasible. The ACE values are compared to Georgia PSD applications for Johns Manville-Winder and Houston American Cement which indicated that ACE values of \$5,800-9,696 were not cost effective for CO control.

### *Energy Analysis*

An energy impact analysis is used to identify if the technically feasible control options result in any significant or unusual energy penalties or benefits. The feasible control options have been evaluated and it has been determined that no unusual energy penalties exist beyond what was considered in the economic analysis described in the previous section. Each of the combustion options will require a substantial amount of increased fuel gas consumption. An analysis of energy benefits was also considered; the various options do not result in any energy benefit for the BP facility.

### *Environmental Analysis*

A review of the control options with respect to the environment was conducted to determine if any of the options created any adverse environmental impacts. The TO, RTO, and RCO control options results in significant increases in energy usage from powering fans with electricity to heating the vent stream with natural gas. Thermal options (TO, RTO, and RCO) will also generate significant quantities of products of combustion such as CO and NO<sub>x</sub> that make these control options less environmentally beneficial. The proposed technically feasible options are not environmentally beneficial and in some cases create byproducts such as secondary air emissions.

#### **4.6.5 Selection of Best Available Control Technology**

Based on the energy, environmental, and economic impacts associated with the technically feasible control options, BP has concluded that the add-on control equipment options are not economically or environmentally feasible. The proposed BACT for CO emissions from the LPA is no further control. BP proposes a BACT limit for CO emissions from the #1 OX LPA of 18.0 tpy (5 lbs/hr) and #2 OX LPA of 15.2 tpy (5 lbs/hr) on a rolling 12-month sum. The LPA provides control for VOC emissions and monitoring has been proposed in Subsection 4.2. No monitoring will be proposed for LPA CO emissions. The LPA only controls VOC and HAPs emissions. Monitoring for VOC has been proposed in Subsection 4.2 as the existing CAM plans. It has no impact

on CO emissions since it does not control CO. Any monitoring of LPA will tell you nothing about the resulting CO emissions. If performance testing of the LPA CO emissions is required, the CO will be determined every 36 months in accordance with Method 10B.

#### 4.7 Best Available Control Technology Analysis for Carbon Monoxide Emissions from High Pressure Absorbers

The OX reactor temperature is controlled by boiling off some of the liquid in the reactor. This vapor stream goes through several stages of condensing, with the condensed liquid being returned to the reactor, before the reactor overhead is sent to the recovery system. This recovery system consists of an acetic acid scrubber and then the HPA. This analysis will be based on the outlet of the HPA recovery device.

Presently the outlet of the HPA is sent to the HPVGTS where the pollutants (VOC, CO, and HAPs) are controlled in a catalytic oxidation reactor and a bromine scrubber before the stream is exhausted to either the inert gas system for use as a carrier gas for the conveying system or the expander for power recovery prior to being exhausted to the atmosphere. Any control option must include a bromine scrubber to comply with the Montreal Protocol agreement on methyl bromide emissions. The carrier gas for the conveying system must not contain over about 5 percent oxygen to avoid explosive conditions in silos with the PTA dust. Therefore, any thermal control system that requires additional air for the control option would have to provide an alternative inert carrier gas (*i.e.*, nitrogen).

The PTE CO emissions from the HPA will be 7,700 tpy for #1 OX HPA and 6,578 tpy for #2 OX HPA.

##### 4.7.1 Identification of Control Technologies

The RBLC database was queried for emission sources and control devices of CO that are used in the process types 64.000, 64.003, and 64.999, SOCFI production. The results of the RBLC search are shown in Appendix C. The search returned seven facilities and nine processes for BACT in these industrial categories. The following control devices were identified from the search:

— CTO — Good Combustion

In the RBLC no control devices were found to apply directly to the PTA manufacturing process. The processes currently utilize a CTO as the add-on control device.

Other resources of control technology were reviewed, such as *EPA Air Pollution Control Technology Fact Sheets*; *EPA Air Pollution Control Cost Manual Sixth Edition*,

EPA/452/B-02-001, January 2002; and the applicable NSPS and NESHAPs standards. The review indicated that control equipment is typically not employed to reduce CO emissions. The results of this review indicated that the following control equipment may be effective in the reduction of CO:

- |       |         |
|-------|---------|
| – TO  | – RTO   |
| – RCO | – Flare |

A BACT analysis was performed for each of the control equipment options. The processes currently utilize catalytic oxidation units and continued utilization of the existing abatement devices was determined to meet BACT for the processes. The other options were determined to be technically infeasible and/or economically infeasible to the control option selected.

#### 4.7.2 Elimination of Infeasible Control Options

Seven control options were evaluated qualitatively to determine if these options are technically feasible. The following control technologies were determined to be technically feasible:

1. TO
2. RTO
3. RCO
4. CTO (existing HPVGTS)

Since the HPA is not a combustion process the good combustion practices control option is not feasible. The Flare is not a feasible option since the emissions factors for CO emissions from a flare in AP-42 (Table 13.5-1) would indicate that more CO would be created from the combustion of all the required supplemental natural gas than would be removed. A detailed economic analysis of the remaining technically feasible options has been performed and is summarized in the following subsections.

#### 4.7.3 Ranking of Remaining Control Technologies

The potential effectiveness of the remaining control options has been evaluated by reviewing manufacturer information and USEPA documents. The remaining control options and their associated anticipated efficiencies are listed below:

CONTROL OPTION	EFFICIENCY (%)
TO/Bromine Scrubber	95
RTO/Bromine Scrubber	95
RCO/Bromine Scrubber	95
CTO (Existing HPVGTS with Bromine Scrubber)	95

#### 4.7.4 Evaluation of Most Effective Control Technologies and Selection of Best Available Control Technology

The BACT analysis is a three-part investigation that includes economic, energy, and environmental impacts. Each of the remaining options was reviewed with respect to the impacts to determine if they meet BACT requirements.

##### *Economic Analysis*

The economic analysis is composed of a calculation of the control technologies' ACE based on a comparison of the cost of each feasible control technology in terms of cost per mass of pollutant removed. In general, technologies with excessive costs per ton of pollutant removed are considered excessive in most cases and the installation of that technology would not be deemed economically feasible.

The ACE was determined by estimating the capital cost for an installed system and the resulting annual operating and maintenance costs. The capital and operating expenses were obtained from using the *EPA Air Pollution Control Cost Manual Sixth Edition*, EPA/452/B-02-001 or *EPA's Air Pollution Control Fact Sheets*. The ACE is estimated according to the following formula:

$$\text{ACE} = (\text{Control Option Annualized Cost}) / (\text{Baseline emission rate} - \text{Control option emission rate})$$

The #1 OX HPA baseline emissions are estimated at 7,700 tpy. This emission rate was used as the baseline emission rate for the BACT analysis. This emission rate is used to determine the ACE for the specific control option. The #1 OX emissions would give the worst case answer since the equipment cost ratio based on relative flow rates would be about 90 percent but the #2 emission rate is only about 85 percent. Therefore the ACE for the #2 OX case would be higher for a comparable control option.

The ACE can be estimated from the above capital and annual operating costs by annualizing the capital cost (multiplying by a factor of 0.10 to simulate a 20-year equipment life and an 8 percent interest rate). This value is added to the annual operating cost and the sum is divided by the product of the control efficiency and the uncontrolled emission rate. Table 4-6 provides a summary of the annualized cost and ACE values for each of the control options. The cost analysis information is provided in Appendix D, BACT Analysis Cost Information.

The emission reduction in the above table includes the destruction of the CO in the inlet stream and the additional CO generated by the combustion of fuel. The ACE value for all the control options would be economically feasible per ton of pollutants removed but the CTO (existing HPVGTS with bromine scrubber) has the largest overall CO destruction and the lowest ACE. Also as shown previously for the VOC control, the CTO (existing HPVGTS) control option was the choice for BACT.

Hence looking at the emission reduction, ACE, and VOC BACT choice, the CTO (existing HPVGTS with bromine scrubber) would be BACT for CO.

### *Energy Analysis*

An energy impact analysis is used to identify if the technically feasible control options result in any significant or unusual energy penalties or benefits. The feasible control options have been evaluated and it has been determined that no unusual energy penalties exist beyond what was considered in the economic analysis described in the previous section. An analysis of energy benefits was also considered; the various options do not result in any energy benefit for the BP facility.

### *Environmental Analysis*

A review of the control options with respect to the environment was conducted to determine if any of the options created any adverse environmental impacts. The TO, RTO, and RCO control options results in significant increases in energy usage from powering fans with electricity to heating vent streams with natural gas. Thermal options (TO, RTO, and RCO) will also generate significant quantities of products of combustion such as GHG, CO, and NO<sub>x</sub> that make these control options less environmentally beneficial. The proposed technically feasible options are not environmentally beneficial and in some cases create byproducts such as secondary air emissions.

Table 4-6  
HPA CO BACT Analysis

CONTROL OPTION	EMISSION REDUCTION (tpy)	TOTAL CAPITAL COST (\$)	ANNUALIZED OPERATING COST (\$)	AVERAGE COST EFFECTIVENESS (\$/ton)	INCREASED ENERGY USAGE (\$/yr)	ADVERSE ENVIRONMENTAL IMPACTS?
TO/Bromine Scrubber	7,160.6	\$2,512,704	\$29,543,821	\$4,126	11,306,341	Yes
RTO/Bromine Scrubber	7,288.6	5,530,255	20,485,522	2,697	1,002,328	Yes
RCO/Bromine Scrubber	7,231.6	3,331,993	29,079,323	3,857	5,563,302	Yes
CTO (Existing HPVGTS with Bromine Scrubber)	7,297.6	0	806,690	111	0	Yes



#### 4.7.5 Selection of Best Available Control Technology

Based on the energy, environmental, and economic impacts associated with the technically feasible control options, BP has concluded that the CTO (existing HPVGTS with bromine scrubber) is the highest control efficiency option with the lowest cost per ton of control. Therefore the CTO (existing HPVGTS with bromine scrubber) control option meets the criteria for BACT. BP proposes a BACT limit for CO emissions from the #1 OX HPA of 385.0 tpy (106 lbs/hr) and #2 OX HPA of 329.0 tpy (90 lbs/hr) on a rolling 12-month sum. This process vent will be subject to the requirements for a CAM plan and will be monitored in accordance with the existing CAM plan. The details of the monitoring are listed in Subsection 2.5 of this application. If performance testing of the HPVGTS CO emissions is required, the CO will be determined every 36 months in accordance with Method 10B.

# Section 5

## Air Quality Analysis

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### 5.1 Background

This project triggers PSD permitting requirements for CO and VOCs only. The project does not involve any new sources of CO but a re-distribution of emissions from one source to another. Modeling is only required for CO emissions. No air quality model exists that can evaluate the air quality impact of a point source of VOC emissions on area-wide ozone concentrations. The changes will allow the facility to operate in a more efficient manner. Because PSD permitting requirements have been triggered, air quality analyses are necessary for the proposed changes.

The project is located at the BP-Cooper River facility (see Figure 5-1). Figures 5-2 and 5-3 provide a representation of the facility's boundary and project source locations.

### 5.2 Modeling Protocol

A modeling protocol was submitted to SC DHEC for review on January 8, 2013. The following section summarizes the approach to the air quality modeling analysis. The air modeling information is included in Appendix G.

#### 5.2.1 Model Selection

Air dispersion modeling was performed using the American Meteorological Society/ Environmental Protection Agency Regulatory Model AERMOD (AERMOD), Version 12345. AERMOD is the preferred model for areas within 50 Km of the source. AERMOD also includes the Plume Rise Model Enhancements (PRIME) algorithms for building downwash.

#### 5.2.2 Information on Urban/Rural Characteristics

The site is located north of the City of Charleston in a predominantly rural area. The AERMOD model was utilized in its non-urban configuration.

#### 5.2.3 Surrounding Terrain

The area surrounding the facility has only minor terrain relief. However following standard AERMOD guidelines, terrain elevations for grid receptors were included in the AERMOD modeling through use of the AERMAP terrain processor and applicable National Elevation Data (NED) files. NED files with NAD83 coordinates were used.

#### 5.2.4 Good Engineering Practice Stack Heights and Building Downwash

No stack in the modeling analysis for this project meets the definition of formula GEP stack height so the BPIP PRIME computer algorithm was used to determine wind directionally dependent building dimensions for use in the AERMOD analysis. A BPIP input file for the facility is included in the modeling files submitted with this application.

#### 5.2.5 Cavity Analysis

Cavities are eddies or areas of nearly stagnant air created on the leeward side of a building. The BP CR facility has the potential to produce cavity impacts. The AERMOD model, with building input data prepared using BPIP PRM algorithm, was used to directly evaluate cavity concentrations.

#### 5.2.6 Meteorological Data

The meteorological data set used in this analysis is from the SC DHEC Website (files CHS-chs\_0206\_.SFC and CHS-chs\_0206\_.pfl). These data are from the Charleston meteorological station. Specifically for this project, SC DHEC has updated the meteorological data set with the use of the AERMET Version 12345 processor.

An assessment was made of the applicability of these meteorological data to a modeling analysis at BP CR. The BP CR site is located less than 10 miles from the Charleston airport (the meteorological observation station). The airport site and the BP CR site are both located about 15 miles from the Atlantic coast. There is only minor terrain relief in this part of South Carolina. The AERSURFACE algorithm was used to assess three basic parameters, albedo, Bowman Ratio, and roughness length on an annual basis for 12 wind sectors (results shown in Tables 5-1 and 5-2). The results in Tables 5-1 and 5-2 show that while there is some degree of similarity for albedo there are differences with Bowen Ratio and surface roughness values between the sites. These differences are typical however for comparing the surface characteristics an observation site at an airport with a site not at an airport. Given the relatively small predicted impacts in comparison to the significant impact levels and considering the proximity of the airport site to the project site, this meteorological data set is considered to be a reasonable choice for this analysis.

Table 5-1  
Charleston Meteorological Site AERSURFACE Parameters

```

** Generated by AERSURFACE, dated 13016
** Generated from "southcarolina.bin"
** Center UTM Easting (meters):      589718.0
** Center UTM Northing (meters):    3640551.0
** UTM Zone: 17      Datum: NAD83
** Study radius (km) for surface roughness: 1.0
** Airport? Y, Continuous snow cover? N
** Surface moisture? Average, Arid region? N
** Month/Season assignments? User-specified
** Late autumn after frost and harvest, or winter with no snow: 1,2
** Winter with continuous snow on the ground: 0
** Transitional spring (partial green coverage, short annuals): 3,4
** Midsummer with lush vegetation: 5,6,7,8,9
** Autumn with unharvested cropland: 10,11,12

```

FREQ_SECT	ANNUAL	12
SECTOR 1	0	30
SECTOR 2	30	60
SECTOR 3	60	90
SECTOR 4	90	120
SECTOR 5	120	150
SECTOR 6	150	180
SECTOR 7	180	210
SECTOR 8	210	240
SECTOR 9	240	270
SECTOR 10	270	300
SECTOR 11	300	330
SECTOR 12	330	360

**		Sect	Alb	Bo	Zo
SITE_CHAR	1	1	0.16	0.70	0.039
SITE_CHAR	1	2	0.16	0.70	0.050
SITE_CHAR	1	3	0.16	0.70	0.054
SITE_CHAR	1	4	0.16	0.70	0.037
SITE_CHAR	1	5	0.16	0.70	0.029
SITE_CHAR	1	6	0.16	0.70	0.023
SITE_CHAR	1	7	0.16	0.70	0.023
SITE_CHAR	1	8	0.16	0.70	0.038
SITE_CHAR	1	9	0.16	0.70	0.039
SITE_CHAR	1	10	0.16	0.70	0.042
SITE_CHAR	1	11	0.16	0.70	0.028
SITE_CHAR	1	12	0.16	0.70	0.022

Table 5-2  
BP Cooper River Site AERSURFACE Parameters

```

** Generated by AERSURFACE, dated 13016
** Generated from "southcarolina.bin"
** Center UTM Easting (meters):      604442.0
** Center UTM Northing (meters):    3648960.0
** UTM Zone: 17      Datum: NAD83
** Study radius (km) for surface roughness: 1.0
** Airport? N, Continuous snow cover? N
** Surface moisture? Average, Arid region? N
** Month/Season assignments? User-specified
** Late autumn after frost and harvest, or winter with no snow: 1,2
** Winter with continuous snow on the ground: 0
** Transitional spring (partial green coverage, short annuals): 3,4
** Midsummer with lush vegetation: 5,6,7,8,9
** Autumn with unharvested cropland: 10,11,12

```

	FREQ_SECT	ANNUAL	12			
	SECTOR	1	0	30		
	SECTOR	2	30	60		
	SECTOR	3	60	90		
	SECTOR	4	90	120		
	SECTOR	5	120	150		
	SECTOR	6	150	180		
	SECTOR	7	180	210		
	SECTOR	8	210	240		
	SECTOR	9	240	270		
	SECTOR	10	270	300		
	SECTOR	11	300	330		
	SECTOR	12	330	360		

**			Sect	Alb	Bo	Zo
	SITE_CHAR	1	1	0.14	0.33	0.787
	SITE_CHAR	1	2	0.14	0.33	0.777
	SITE_CHAR	1	3	0.14	0.33	0.839
	SITE_CHAR	1	4	0.14	0.33	0.855
	SITE_CHAR	1	5	0.14	0.33	0.791
	SITE_CHAR	1	6	0.14	0.33	0.420
	SITE_CHAR	1	7	0.14	0.33	0.476
	SITE_CHAR	1	8	0.14	0.33	0.520
	SITE_CHAR	1	9	0.14	0.33	0.351
	SITE_CHAR	1	10	0.14	0.33	0.569
	SITE_CHAR	1	11	0.14	0.33	0.690
...	SITE_CHAR	1	12	0.14	0.33	0.753

### 5.2.7 Model Receptors

Receptors were placed along the fence at a spacing of 25 meters to 50 meters out to a distance to define the maximum predicted impacts as being within the interior of the grid. The maximum predicted impacts were on the facility boundary in an area of 25 to 50 meter spacing. Figure 5-4 contains a representation of the receptors used in the analysis.

### 5.2.8 Visibility Impairment Analysis

This project triggers PSD air quality evaluation requirements for CO and VOCs only. Neither of these pollutants is typically understood to affect visibility so no visibility impairment assessment is needed or was undertaken.

### 5.2.9 Toxic Air Pollutant Analysis

The facility is not subject to a South Carolina Standard No. 8 modeling evaluation because processes at the facility that emit Standard No. 8 pollutants are subject to MACT requirements which can be substituted to meet Standard No. 8 requirements.

## 5.3 Class I Area Impact Analysis

The responsible FLMs for the Cape Romain Class I area have been contacted and provided information concerning the proposed BP CR project. The land managers did not have any comments concerning the project.

As indicated earlier, this project triggers PSD requirements only for CO and VOCs only. Project net emission increases of nitrogen dioxide (NO<sub>2</sub>), SO<sub>2</sub>, and PM (PM<sub>10</sub> and PM<sub>2.5</sub>) do not exceed PSD significance levels. The tools available for a visibility analysis (such as VISCREEN) do not include inputs for CO and VOC emissions, so it is assumed this project would have minimal impacts on visibility in the Class I area.

## 5.4 Significance Modeling Results for Carbon Monoxide

Project emissions of CO are summarized in Table 5-3. The basis for these emission estimates are presented in other parts of this application. Figure 5-3 shows the location of the project sources.

It should be noted that while Table 5-3 shows an offset emission source with a negative emission rate for #1 OX DHT Overhead Scrubber (BT-702). This source would have operated at that rate only sporadically. Consequently a separate source group was used that included only the four stacks with the positive emissions rates. These results are shown below. The initial modeling analysis showed the following worst-case impacts.

Table 5-3  
Project Emission Sources with Parameters

MODEL ID	DESCRIPTION	X (m)	Y (m)	ELEV. (m)	PROJECT EMISSIONS (g/s)	PROJECT EMISSIONS (lb/hr)	STACK HEIGHT (m)	TEMP. (K)	VEL. (m/s)	DIAM. (m)
BT_702 <sup>(1)</sup>	DHT Overhead Scrubber	604491.1	3649074	10.02	-10.96	-87.0	10.67	305	21.3	0.304
BT_603	LPA	604628.1	3649119	8.67	0.517	4.1	21.5	322	3.4	0.762
HPVGTS-1	HPVGTS-1	604666.1	3649104	8.81	11.075	87.9	30.48	350	79.8	0.91
DT_302	LPA	604521.3	3648901	8.75	0.437	3.5	24.4	308	0.98	1.07
HPVGTS-2	HPVGTS-2	604642.3	3648896	8.92	9.45	75.0	41.46	333	29.87	1.3

<sup>(1)</sup> Source would historically operate at the listed emission rates only occasionally. An analysis was completed with all five sources operating and another with only the four stacks with the positive emission rates.

- n 1-hour CO Highest Predicted Impact 143 micrograms per cubic meter ( $\mu\text{g}/\text{m}^3$ )
- n 8- hour CO Highest Predicted Impact 70  $\mu\text{g}/\text{m}^3$

These predicted values are below the PSD significant impact thresholds of 2,000  $\mu\text{g}/\text{m}^3$  (1-hour) and 500  $\mu\text{g}/\text{m}^3$  (8-hours). Therefore, no further modeling analysis of emissions for Standard No. 2 is needed.

## 5.5 Preconstruction Monitoring Requirements

The worst case predicted concentrations are also below the Preconstruction Monitoring threshold of 575  $\mu\text{g}/\text{m}^3$ .

No further analysis is therefore needed for CO for this project.

## 5.6 Analysis for Volatile Organic Compound Impact

No air quality model exists that can evaluate the air quality impact of a point source of VOC emissions on area-wide ozone concentrations. This project was evaluated using a project related net increase in VOC emissions of 72.6 tpy. The estimated increase in emissions of  $\text{NO}_x$  is below the PSD significant emission increase threshold.

The area measured values of ozone in the Charleston area for the last 3 years are listed below.

- n Bushy Park Monitor # 45015002  
8-hour average 4<sup>th</sup> high – 0.061 parts per million (ppm), 0.065 ppm, 0.066 ppm (2012, 2011, 2010)
- n Cape Romain # 450190046  
8-hour average 4<sup>th</sup> high – 0.064 ppm, 0.066 ppm, 0.068 ppm (2012, 2011, 2010)

The National Ambient Air Quality Standard (NAAQS) for ozone is 0.075 ppm. The monitored values above show the area to be well in attainment of the 8-hour ozone NAAQS.

The VOC impact was based on the project having a relative small increase in VOC emissions of 72.4 tpy and less than 40 tpy of  $\text{NO}_x$  emissions. Ozone concentrations in South Carolina have been shown to be limited by the presence of  $\text{NO}_x$ . This project does not result in a significant increase in  $\text{NO}_x$  emissions so it would be expected that the project as a whole would have minimal impact on area ozone concentrations.

To better assess the relative nature of the project increase in VOC emissions, average actual VOC emissions for the Charleston County and three other surrounding Counties are presented below.



COUNTY	3-YEAR AVERAGE ACTUAL VOC EMISSIONS (tpy)
Charleston	1,430
Berkeley	1,625
Dorchester	470
Colleton	857
Total for Area	4,382

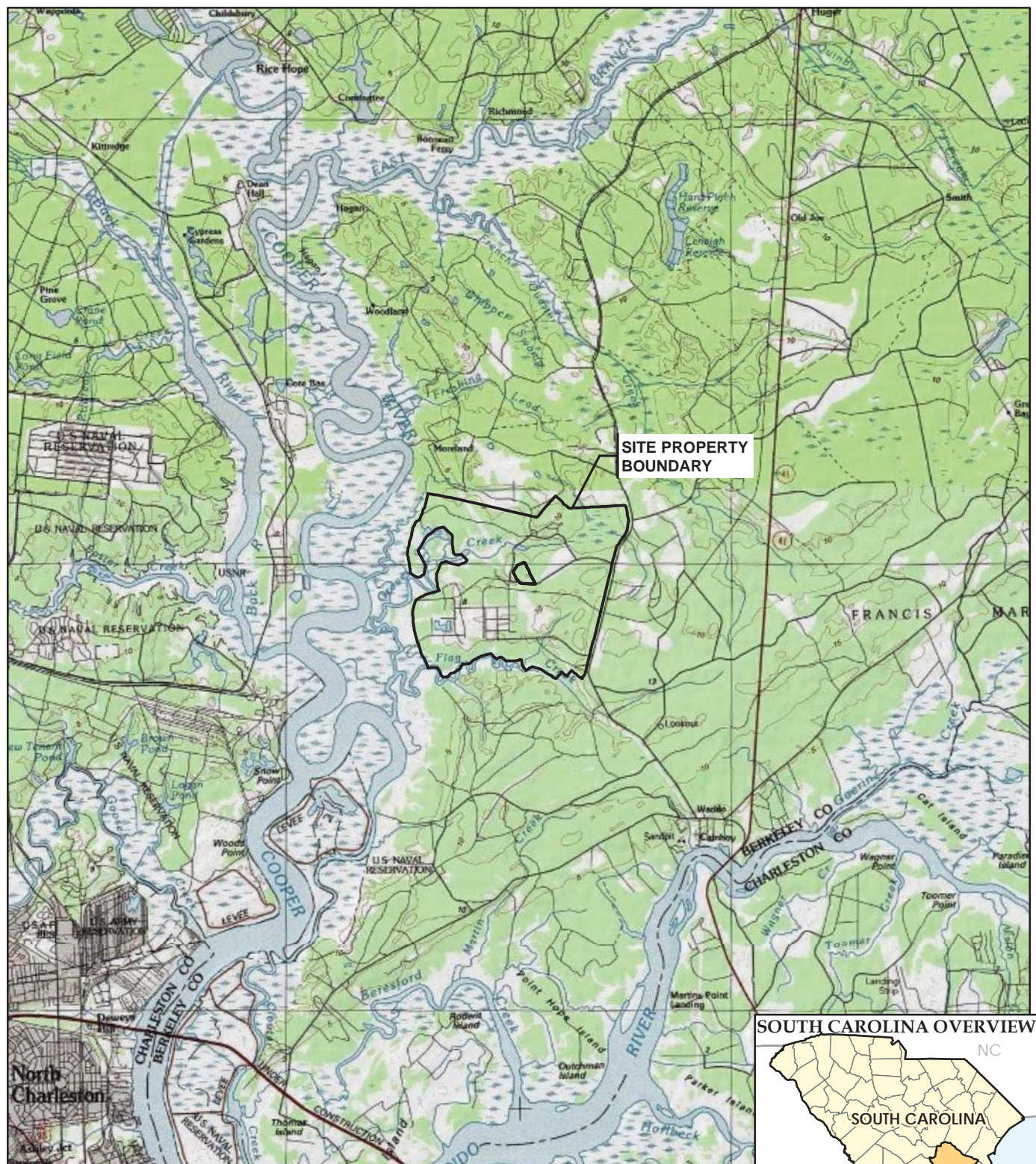
The project VOC emissions impact was based on an estimated VOC emissions increase of 72.6 tpy from this project. This value represents 1.7 percent of the actual area-wide point source emissions of VOCs. Note that this total does not include mobile sources or emissions from minor sources in the area.

Because project emission level increases for VOCs for this project are relatively small and the project does not have a significant increase in NO<sub>x</sub> emissions (recall the area is NO<sub>x</sub> limited with respect to the formation of ozone), it is concluded this project would not cause area-wide ozone concentrations to increase significantly.

## 5.7 Preconstruction Monitoring for Ozone

The project emissions of VOCs do not exceed the monitoring *de minimis* threshold of 100 tpy of VOC emissions. Consequently no preconstruction monitoring of ozone is needed for the project.

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BASE MAP FROM USGS 100K TOPOGRAPHIC MAP SERIES.



708 Heartland Trail  
Suite 3000  
Madison, WI 53717  
Phone: 608.826.3600

**BP COOPER RIVER  
SOUTH CAROLINA**

**FIGURE 5-1  
SITE LOCATION MAP**

DRAWN BY:	PAPEZ J
APPROVED BY:	FOX D
PROJECT NO:	187464
FILE NO.	187464-003slm.mxd
DATE:	JANUARY 2013



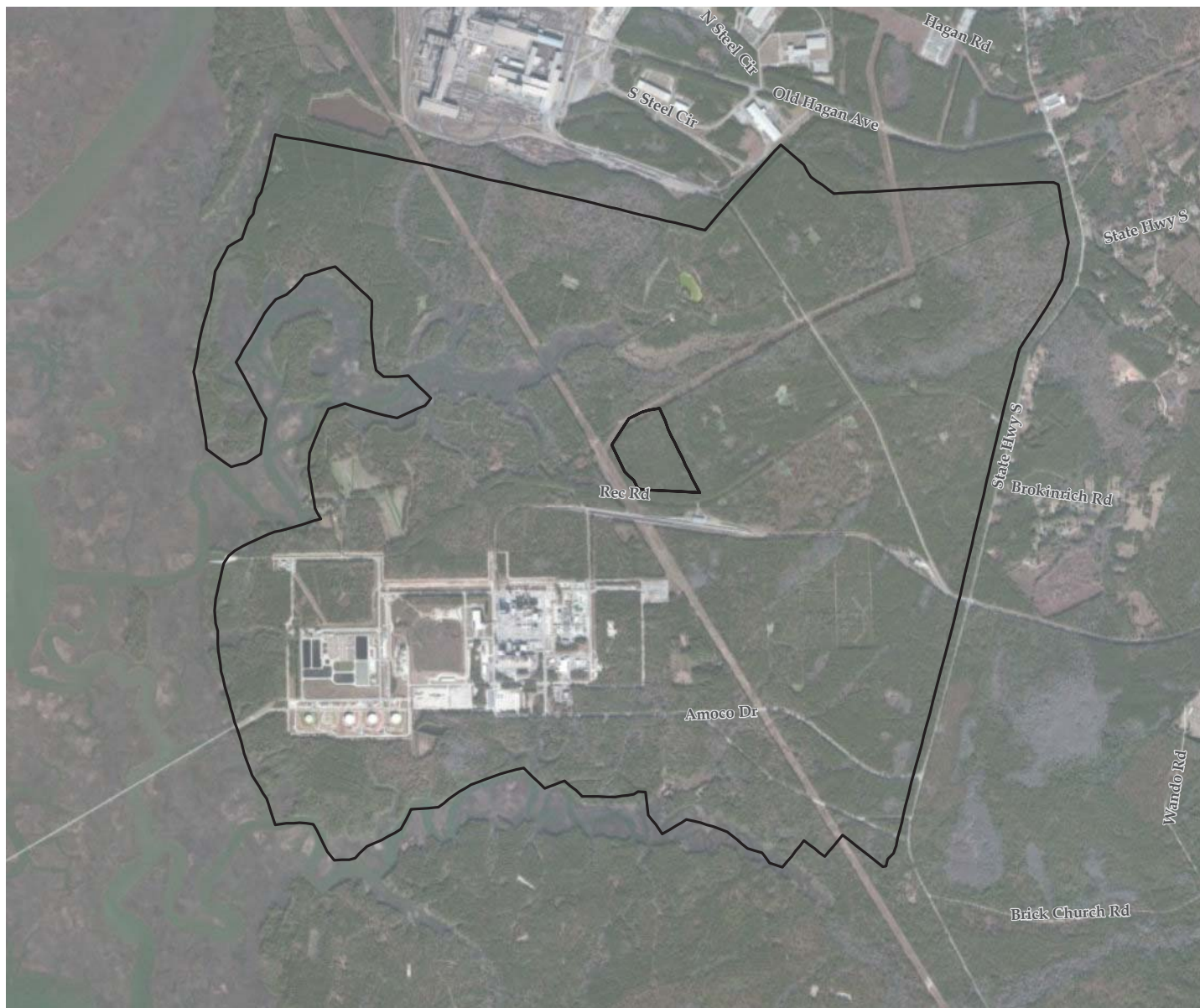
## LEGEND



APPROXIMATE FACILITY BOUNDARY

## NOTES

1. BASE MAP IMAGERY FROM ESRI WEB SERVICE BASEMAP LAYER, "WORLD IMAGERY".



0 3,000 6,000  
FEET

1 INCH = 3,000 FEET

1:36,000

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Phone: 608.826.3600  
www.trcsolutions.com



**BP COOPER RIVER  
SOUTH CAROLINA**

**FIGURE 5-2  
SITE MAP - FACILITY BOUNDARY**

DRAWN BY:	PAPEZ J
APPROVED BY:	FOX D
PROJ. NO.:	187464
FILE NO.:	187464-001.mxd
DATE:	JANUARY 2013



## LEGEND

-  APPROXIMATE FACILITY BOUNDARY
-  STACK LOCATION

## NOTES

1. BASE MAP IMAGERY FROM ESRI WEB SERVICE BASEMAP LAYER, "WORLD IMAGERY".



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FEET

1 INCH = 1,000 FEET  
1:12,000

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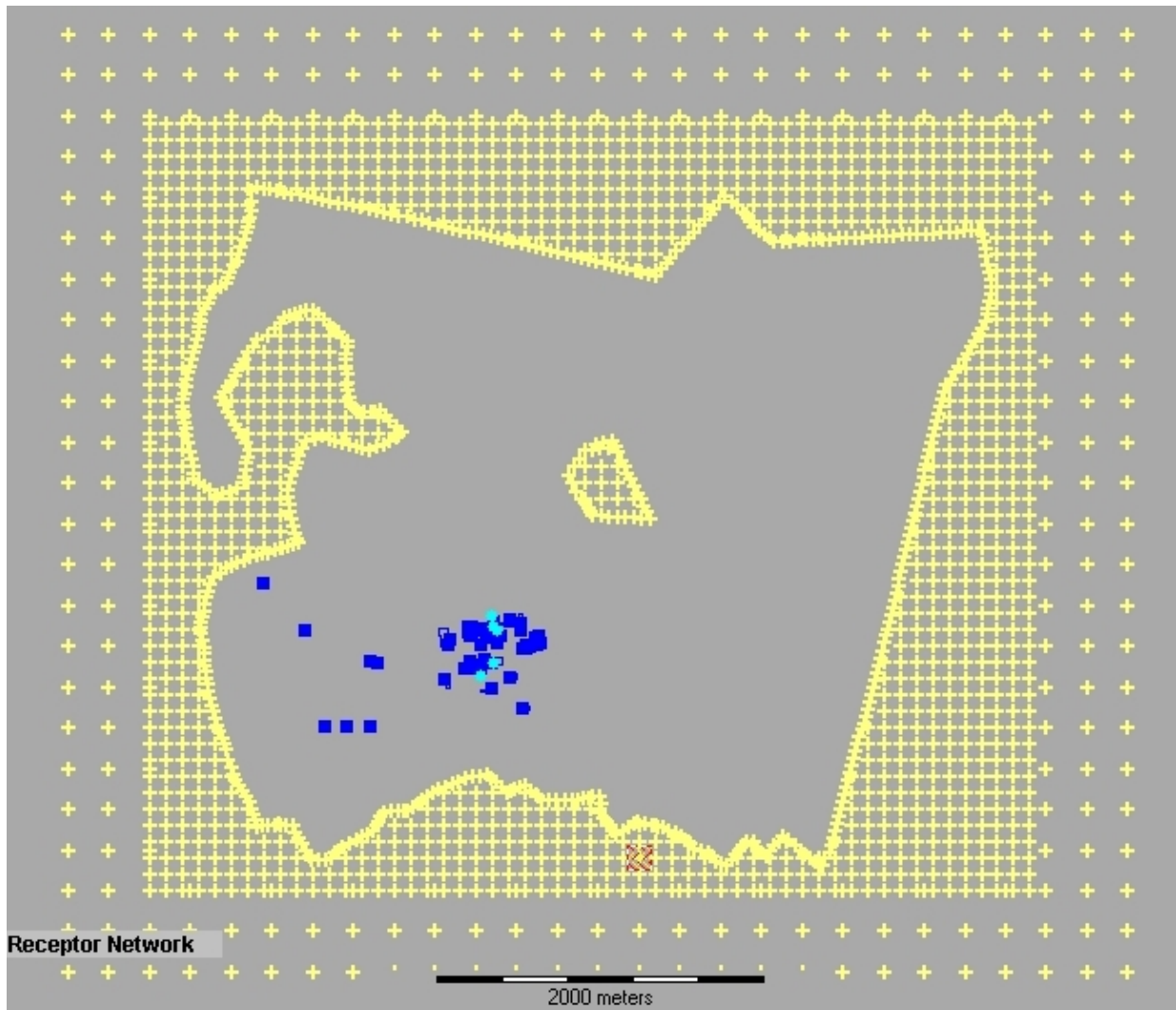
708 Heartland Trail, Suite 3000  
Madison, WI 53717  
Phone: 608.826.3600  
www.trcsolutions.com

**BP COOPER RIVER  
SOUTH CAROLINA**

**FIGURE 5-3  
PROJECT EMISSION SOURCES**

DRAWN BY:	PAPEZ J
APPROVED BY:	FOX D
PROJ. NO.:	187464
FILE NO.:	187464-002.mxd
DATE:	JANUARY 2013

Figure 5-4  
Receptor Network



## Section 6

# Additional Impacts Analyses

---

The provisions of South Carolina Regulation 62.5, Standard No. 7 require that additional environmental impact analyses be performed to determine the impairment to visibility, soil, and vegetation that would occur as a result of construction and operation of a major source or a modification to a major source. These regulatory provisions also require that analyses be performed to determine the general commercial, residential, industrial, and other growth associated with operation of a major source or modification, as well as the air quality impact projected for the area as a result of such growth.

### 6.1 Visibility/Regional Haze

As indicated earlier in this report, the project is projected to have insignificant impact on regional visibility or haze due to the fact that the project triggers PSD requirements only for CO and VOCs. Neither pollutant is a variable that is input in models to determine visibility impacts (such as in the VISCREEN algorithm).

### 6.2 Associated Growth Impacts

The proposed modification at the BP CR facility is not anticipated to result in any significant increase in full-time employment (an associated increase in traffic flow) at the facility. The construction activity related to the project may allow for a temporary increase in local traffic due to construction related jobs and associated traffic.

### 6.3 Impacts on Soil and Vegetation

CO at the insignificant predicted levels of concentration for this project do not have any known effects on soils or vegetation. VOC emissions from the project are not projected to have any significant effect on local ozone concentrations. Consequently, no effects on soils or vegetation would be expected from the project.

# Section 7

## Title V Permit Revisions for PSD Application

---

The implementation of the requested permit limits will require the revision of some of the permit condition contained in the existing Title V permit. Many of these revisions have been requested in the Title V permit renewal application submitted in January 2012. However, there are some additional Title V permit revisions that will become necessary due to this permit application. The following are some examples of the necessary Title V permit revisions:

- n Recognition that the two boilers are gas-fired units rather than oil fired
- n Revision of the oil and emissions limits on the boilers
- n Revision of 40 CFR 63 Subpart DDDDD and 40 CFR 60 Subpart Db requirements for boilers since gas-fired
- n Existing emissions limits for VOC and CO in the OX and PTA units to be replaced with the new BACT emission limits
- n Removal of emission points from permit where equipment and emissions are being removed from the process
- n Removal of #2 OX requirements for a Group 1 HON process vent since all are now Group 2 vents.

The following existing specific emissions limits in Table 7-1 will be replaced by the BACT limits or revised due to regulatory status changes in the application:

Table 7-1  
Emission Limits

UNIT ID	POLLUTANT	LIMIT	UNIT ID	POLLUTANT	LIMIT
03 (#1 HPVGTS)	CO	1,452 lb/hr	03 (BT-702)	VOC	60 lb/hr
03 (#1 HPVGTS)	CO	375 tpy	03 (BT-702)	VOC	165 tpy
03 (#1 HPVGTS)	VOC	85 lb/hr	03-06	VOC	1825 tpy
03 (#1 HPVGTS)	VOC	80 tpy	03-06 (HPVGT)	DRE	95%
03 (#1 LPA)	CO	40 tpy	05-06	VOC	49.3 lb/hr
03 (#1 LPA)	VOC	40 lb/hr	05-06	VOC	215.9 tpy
03 (#1 LPA)	VOC	80 tpy	15-16 Boilers	CO	400 ppm
03 (BT-702)	CO	380 tpy	15-16 Boilers	Oil use	18.675 MM gal



The Title V permit mark-up that was included in the Title V renewal is included in Appendix E. The Title V mark-up has the revisions necessary for this PSD application indicated with yellow highlighting.



# Appendix A

## SC DHEC Permit Application Forms

---



**Bureau of Air Quality  
Expedited Review Request  
Construction Permits  
Page 1 of 1**

BAQ Use: Recv'd By:

To be eligible for expedited review, the appropriate Construction Permit Application Forms must be included with this sheet.

FACILITY IDENTIFICATION	
Facility Name: BP AMOCO Chemical Company - Cooper River Plant	
Application Date: 4/09/2013 - Revised 3/04/2014	SC Air Permit Number (8-digits only): 0420 - 0029

PRIMARY AIR PERMIT CONTACT			
Title/Position: Environmental Engineer	Salutation: Mr..	First Name: Brent	Last Name: Pace
E-mail Address: Brent.Pace@bp.com		Phone No.: 843.881.5182	Cell No.: 419.303.3987

SECONDARY AIR PERMIT CONTACT			
(If the Department is unable to contact the primary air permit contact please provide a secondary contact.)			
Title/Position: HSSE Manager	Salutation: Ms..	First Name: Judith	Last Name: Lesslie
E-mail Address: Judith.Lesslie@bp.com		Phone No.: 843.881.5392	Cell No.: 843.870.9134

Check One	Permit Type	Fee*
<input type="checkbox"/>	Minor Source Construction Permit	\$3,000
<input type="checkbox"/>	Synthetic Minor Construction Permit	\$4,000
<input checked="" type="checkbox"/>	Prevention of Significant Deterioration (PSD) not impacting a Class I Area (no Class I modeling required)	\$20,000
<input type="checkbox"/>	Prevention of Significant Deterioration (PSD) impacting a Class I Area (Class I modeling required)	\$25,000
<b>General Permit Program</b>		
<input type="checkbox"/>	Minor Source Construction Permit / Relocation Request (Concrete)	\$1,500
<input type="checkbox"/>	Minor Source Construction Permit / Relocation Request (Asphalt)	\$2,000
<input type="checkbox"/>	Synthetic Minor Source Construction Permit / Relocation Request (Concrete)	\$3,000
<input type="checkbox"/>	Synthetic Minor Source Construction Permit / Relocation Request (Asphalt)	\$3,500

\* **DO NOT** send fee payment with this form. If chosen for expedited review, you will be notified by phone for verbal acceptance into the program. Fees must be paid within five business days of acceptance.

PRIMARY AIR PERMIT CONTACT SIGNATURE	
I have read the Expedited Review Program Standard Operating Procedures and accept all of the terms and conditions within. I understand that it is my responsibility to ensure an application of the highest quality is submitted in a timely manner, and to address any requests for additional information by the deadline specified. I understand that submittal of this request form is not a guarantee that expedited review will be granted.	

	3/10/14
Signature of Primary Air Permit Contact	Date



**Bureau of Air Quality**  
**Construction Permit Application**  
**Facility Information**  
**Page 1 of 2**

BAQ Use: CP ID:      Recv'd By:

A. FACILITY INFORMATION		
1. SC Air Permit Number (8-digits only): 0420 - 0029		2. Application Date: 4/09/2013- Revised 03/04/2014
3. Facility Name: BP Amoco Chemical Company - Cooper River Plant		4. Facility Federal Tax Identification No.: SCD084703909
5. Physical Address: 1306 Amoco Dr.		6. County: Berkeley
7. City: Wando	State: SC	8. Zip Code: 29492
9. Facility Coordinates Facility coordinates should be based at the front door or main entrance of the facility.		
Latitude: 604725.47E	Longitude: 3648659.14N	<input checked="" type="checkbox"/> NAD27 or <input type="checkbox"/> NAD83

B. COMPANY INFORMATION		
1. Company Name: BP Amoco Chemical Company - Cooper River Plant		
2. Mailing Address: 1306 Amoco Dr.		
3. City: Wando	4. State: SC	5. Zip Code: 29492

C. CO-LOCATION DETERMINATION	
Are there other facilities in close proximity that could be considered co-located? <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes**	
List potential co-located facilities, including air permit numbers if applicable:	
If applicable, location in application for co-location determination:	
(**If yes, please submit co-location applicability determination details in an attachment to this application.)	

D. CONFIDENTIAL INFORMATION / DATA	
Does this application contain confidential information or data? <input type="checkbox"/> No <input checked="" type="checkbox"/> Yes***	
(***)If yes, include a sanitized version of the application for public review.)	

E. COMMUNITY OUTREACH	
What are the potential air issues and community concern Based on previous modeling and the modeling attached to this application, there are no potential air issues / community concerns from this project	

F. FACILITY'S PRODUCTS / SERVICES	
1. Primary Products / Services: Purified Terephthalic Acid (PTA)	
2. Primary SIC Code: 2869	3. Primary NAICS Code: 325199
4. Other Products / Services:	
5. Other SIC Code(s):	6. Other NAICS Code(s):

G. AIR PERMIT CONTACT			
(Person who can answer questions about the facility and permit application.)			
Title/Position: Environmental Engineer	Salutation: Mr.	First Name: Brent	Last Name: Pace
Mailing Address: 1306 Amoco Dr.			
City: Wando	State: SC	Zip Code: 29492	
E-mail Address: Brent.Pace@bp.com	Phone No.: 843.881.5182	Cell No.: 419.303.3987	

The signed permit will be mailed to the Air Permit Contact listed above unless otherwise indicated below. Only one hard copy of the permit will be mailed via the postal service. Additional copies can be sent electronically. Please indicate below any additional individuals who should receive a copy of the permit.	
Name	E-mail Address
Michael Doerner	mdoerner@trcsolutions.com



**Bureau of Air Quality  
Construction Permit Application  
Facility Information  
Page 2 of 2**

<b>H. OWNER OR OPERATOR</b>			
Title/Position: Plant Manager	Salutation: Mr.	First Name: Mark	Last Name: Fitts
Mailing Address: 1306 Amoco Dr.			
City: Wando	State: SC		Zip Code: 29492
E-mail Address: mark.fitts@bp.com	Phone No.: 843.881.5201		Cell No.:
<b>OWNER OR OPERATOR SIGNATURE</b>			
I certify, to the best of my knowledge and belief, that no applicable standards and/or regulations will be contravened or violated. I certify that any application form, report, or compliance certification submitted in this permit application is true, accurate, and complete based on information and belief formed after reasonable inquiry. I understand that any statements and/or descriptions, which are found to be incorrect, may result in the immediate revocation of any permit issued for this application.			

*M E Fitts*  
Signature of Owner or Operator

*3/10/2014*  
Date

<b>I. AIR PERMIT CONSULTANT</b> (If not the same person as the Professional Engineer.)			
Consulting Firm Name: TRC Environmental Corporation			
Title/Position: Air Quality Specialist	Salutation: Mr.	First Name: Michael	Last Name: Doerner
Mailing Address: 30 Patewood Dr. Suite 300			
City: Greenville	State: SC		Zip Code: 29615
E-mail Address: mdoerner@trcsolutions.com	Phone No.: 864.234.9481		Cell No.: 864.884.2683

<b>J. PROFESSIONAL ENGINEER INFORMATION</b>			
Consulting Firm Name: TRC Environmental Corporation			
Title/Position: Project Manager	Salutation: Mr.	First Name: Robert	Last Name: vandenMeiracker
Mailing Address: 30 Patewood Dr. Suite 300			
City: Greenville	State: SC		Zip Code: 29615
E-mail Address: RVandenMeiracker@trcsolutions.com	Phone No.: 864.234.9177		Cell No.: 864.787.5261
SC License/Registration No.: 28265			

<b>K. LIST OF FORMS INCLUDED</b>	
Form Name	Included (Y/N)
Equipment/Processes (DHEC Form 2567)	<input checked="" type="checkbox"/> Yes
Control Devices (DHEC Form 2568)	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If No; Explain
Emissions (DHEC Form 2569)	<input checked="" type="checkbox"/> Yes
Regulatory Review (DHEC Form 2570)	<input checked="" type="checkbox"/> Yes
Modeling Information (DHEC Form 2573)	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No If No; Explain
Expedited Review Request (DHEC Form 2212)	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

<b>L. PROFESSIONAL ENGINEER SIGNATURE</b>
I have placed my signature and seal on the engineering documents submitted, signifying that I have reviewed this construction permit application as it pertains to the requirements of South Carolina Regulation 61-62, Air Pollution Control Regulations and Standards.

*Robert Francis vandenMeiracker*  
Signature of Professional Engineer

*3/10/2014*  
Date



**Bureau of Air Quality  
Construction Permit Application  
Equipment / Processes  
Page 1 of 3**

**A. APPLICATION IDENTIFICATION**

1. Facility Name: BP Amoco Chemical Company - Cooper River Plant	
2. SC Air Permit Number (8-digits only): 0420 - 0029	3. Application Date: 4/09/2013 – Revised 03/04/2014

**B. PROJECT DESCRIPTION**

Brief Project Description (What, why, how, etc.): #1 and #2 OX units: These units produce Terephthalic Acid (TA) by the air oxidation of p-Xylene (PX) in a acetic acid (HAC) solvent. The TA solid product is crystallized from the solvent, filtered, dried and sent to intermediate storage silos. A more complete description is included in sections 1 and 2 of the application.

**C. ATTACHMENTS**

1. <input checked="" type="checkbox"/> Process Flow Diagram	2. Location in Application: Located in Section 2 of the application
3. <input checked="" type="checkbox"/> Detailed Project Description	4. Location in Application: Located in Section 1 and 2 of the application

**D. EQUIPMENT / PROCESS INFORMATION**

1. Equipment ID / Process ID	2. Action	3. Equipment / Process Description	4. Maximum Design Capacity (Units)	5. Fuels Combusted	6. Control Device ID(s)	7. Emission Point ID(s)	8. Raw Material(s)	9. Product(s)	10. Pollutant(s)/ Parameter(s) Monitored	11. Monitoring Frequency	12. Reporting Frequency	13. Monitoring / Reporting Basis
<b>#1 OX</b>		<b>Oxidation Unit</b>	<b>Confidential</b>				<b>PX/Air</b>	<b>TA</b>				
BR-301A	R	Reactor*	----	N/A	#1 HPVGTS	O- 2/10/15	N/A	N/A	----	----	----	----
BR-301B	R	Reactor*	---	N/A	#1 HPVGTS	O- 2/10/15	N/A	N/A	----	----	----	----
BR-301C	R	Reactor*	---	N/A	#1 HPVGTS	O- 2/10/15	N/A	N/A	----	----	----	----
BR-301D	R	Reactor*	---	N/A	#1 HPVGTS	O- 2/10/15	N/A	N/A	----	----	----	----
BT-605	R	Solvent Stripper	---	N/A	N/A	N/A	N/A	N/A	----	----	----	----
BM-606	R	Residue Evaporator	---	N/A	N/A	N/A	N/A	N/A	----	----	----	----
BD-625	R	CRU- Extraction Drum	---	N/A	N/A	O-11	N/A	N/A	----	----	----	----
BD-631	R	CRU - ML Drum	---	N/A	N/A	O-12	N/A	N/A	----	----	----	----
BD-632	R	CRU-Solid Reslurry Drum	---	N/A	N/A	O-13	N/A	N/A	----	----	----	----
BE-645	R	CRU - Condenser	---	N/A	N/A	O-16	N/A	N/A	----	----	----	----
BC-710	R	LPVGT	---	N/A	N/A	N/A	N/A	N/A	----	----	----	----
BR-301	N	Reactor*	---	N/A	#1 HPVGTS	O- 2/10/15	N/A	N/A	N/A	!! FORMTE	N/A	N/A
BT-701	M	Dehydration Tower	---	N/A	N/A	O-3	N/A	N/A	HON MACT	HON MACT	HON MACT	HON MACT



**Bureau of Air Quality**  
**Construction Permit Application**  
**Equipment / Processes**  
**Page 2 of 3**

<b>D. EQUIPMENT / PROCESS INFORMATION</b>												
1. Equipment ID / Process ID	2. Action	3. Equipment / Process Description	4. Maximum Design Capacity (Units)	5. Fuels Combusted	6. Control Device ID(s)	7. Emission Point ID(s)	8. Raw Material(s)	9. Product(s)	10. Pollutant(s)/ Parameter(s) Monitored	11. Monitoring Frequency	12. Reporting Frequency	13. Monitoring / Reporting Basis
BD-401	M	1 <sup>st</sup> Crystallizer	---	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BT-603	M	Low Pressure Absorber	---	N/A	N/A	O-3	N/A	N/A	HON MACT	HON MACT	HON MACT	HON MACT
BC-104	M	Power Recovery Expander	---	N/A	N/A	O- 2/10/15	N/A	N/A	N/A	N/A	N/A	N/A
BD-200	N	PX Feed Drum	---	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BC-906	N	60# Steam Generator**	<b>Confidential</b>	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BT-400	M	PX Scrubber	---	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BT-401	M	HP Absorber	---	N/A	#1 HPVGTS	O- 2/10/15	N/A	N/A	HON MACT	HON MACT	HON MACT	HON MACT
BD-604	M	Azeo Storage Drum	---	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BT-700	N	Liquid-Liquid Extraction Tower	---	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BM-1107	N	ROG Chiller	---	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BF-1405	N	NBA Storage Tank	---	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BT-750	N	Entrainer Recovery Tower	---	N/A	N/A	O-3	N/A	N/A	N/A	N/A	N/A	N/A
BD-204	M	Feed Mix Drum	---	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BD-503	M	Filter Vacuum Sep. Drum	---	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BM- 1101A/B	M	Off-Gas Dryer	---	N/A	N/A	O- 2/10/15	N/A	N/A	N/A	N/A	N/A	N/A
BM- 1101C/D	M	Off-Gas Dryer	---	N/A	N/A	O- 2/10/15	N/A	N/A	N/A	N/A	N/A	N/A
<b>#2 OX</b>		<b>Oxidation Unit</b>	<b>Confidential</b>	<b>NG</b>			<b>PX/Air</b>	<b>TA</b>				
DC-710	R	LPVGT	---	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DT-402	R	Solvent Stripper	---	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DM-403	R	Residue Evaporator	---	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DD-412	R	CRU Extraction Drum	---	N/A	N/A	O2-6	N/A	N/A	N/A	N/A	N/A	N/A
DD-413	R	CRU Slurry Drum	---	N/A	N/A	O2-7	N/A	N/A	N/A	N/A	N/A	N/A
DD-414	R	CRU ML Drum	---	N/A	N/A	O2-8	N/A	N/A	N/A	N/A	N/A	N/A
DE-416	R	CRU Evap OH Condenser	---	N/A	N/A	O2-9	N/A	N/A	N/A	N/A	N/A	N/A
DT-404	R	PX Stripper	---	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A



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<b>D. EQUIPMENT / PROCESS INFORMATION</b>												
1. Equipment ID / Process ID	2. Action	3. Equipment / Process Description	4. Maximum Design Capacity (Units)	5. Fuels Combusted	6. Control Device ID(s)	7. Emission Point ID(s)	8. Raw Material(s)	9. Product(s)	10. Pollutant(s)/ Parameter(s) Monitored	11. Monitoring Frequency	12. Reporting Frequency	13. Monitoring / Reporting Basis
DT-403	M	Dehydration Tower	---	N/A	N/A	O2-1	N/A	N/A	HON MACT	HON MACT	HON MACT	HON MACT
DT-302	M	Low Pressure Absorber	---	N/A	N/A	O2-1	N/A	N/A	HON MACT	HON MACT	HON MACT	HON MACT
DC-104	M	Power Recovery Expander	---	N/A	N/A	O2-3/4	N/A	N/A	N/A	N/A	N/A	N/A
DD-402	M	Azeo Storage Drum	---	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DT-400	N	Liquid-Liquid Extraction Tower	-----	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DT-404	N	DHT Scrubber	---	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DF-460	N	NBA Storage Tank	---	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DT-450	N	Entrainer Recovery Tower	---	N/A	N/A	O2-1	N/A	N/A	N/A	N/A	N/A	N/A
DC-906	N	60# Steam Generator**	<b>Confidential</b>	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
<b>NOTES</b>												
*		Reactor includes overhead condensers										
**		60# Steam Generator will only provide power for internal use.										



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Equipment / Processes  
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**A. APPLICATION IDENTIFICATION**

1. Facility Name: BP Amoco Chemical Company - Cooper River Plant	
2. SC Air Permit Number (8-digits only): 0420 - 0029	3. Application Date: 4/09/2013 - Revised 3/04/2014

**B. PROJECT DESCRIPTION**

Brief Project Description (What, why, how, etc.): #1 and #2 PTA units: These units produce Purified Terephthalic Acid (PTA) by the hydrogenation of the TA in a water slurry to change the impurities into a compound that can be separated from the TA to improve its purity. The PTA product is separated from the impurities, dried and sent to storage silos. A more complete description is included in sections 1 and 2 of the application.

**C. ATTACHMENTS**

1. <input checked="" type="checkbox"/> Process Flow Diagram	2. Location in Application: Located in Section 2 of the application
3. <input checked="" type="checkbox"/> Detailed Project Description	4. Location in Application: Located in Section 1 and 2 of the application

**D. EQUIPMENT / PROCESS INFORMATION**

1. Equipment ID / Process ID	2. Action	3. Equipment / Process Description	4. Maximum Design Capacity (Units)	5. Fuels Combusted	6. Control Device ID(s)	7. Emission Point ID(s)	8. Raw Material(s)	9. Product(s)	10. Pollutant(s)/ Parameter(s) Monitored	11. Monitoring Frequency	12. Reporting Frequency	13. Monitoring / Reporting Basis
<b>#1 PTA</b>		<b>PTA Unit</b>	<b>Confidential</b>	<b>N/A</b>			<b>TA/H2</b>	<b>PTA</b>				
CM-301	M	Crystallizer Vent Scrubber	----	N/A	N/A	P-2	N/A	N/A	PM/ Pressure	Daily	Semiannual	CAM Plan
CD-304	N	Crystallizer	----	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<b>#2 PTA</b>		<b>PTA Unit</b>	<b>Confidential</b>	<b>N/A</b>			<b>TA/H2</b>	<b>PTA</b>				
DM-601	M	Crystallizer Vent Scrubber	----	N/A	N/A	P2-2	N/A	N/A	PM/Flow	Continuous	Semiannual	CAM Plan





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**Control Devices**  
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**A. APPLICATION IDENTIFICATION**

1. Facility Name: BP Amoco Chemical Company - Cooper River Plant													
2. SC Air Permit Number (8-digits only): 0420 - 0029								3. Application Date: 4/09/2013 - Revised 3/04/2014					

**B. CONTROL DEVICE INFORMATION**

1. Control Device ID	2. Action	3. Pollutants Controlled (Include CAS#)	4. Control Device Description	5. Maximum Design Capacity (Units)	6. Fuels Combusted	7. Inherent/ Required/ Voluntary (Explain)	8. Capture System Efficiency and Description	9. Destruction/ Removal Efficiency Determination	10. Pollutant(s)/ Parameter(s) Monitored	11. Averaging Period(s)	12. Monitoring Frequency	13. Reporting Frequency	14. Monitoring/ Reporting Basis
CD – BE-645	R	VOC	Condenser	N/A	N/A	----	----	----	----	----	----	----	----
CD – CM-301	M	PM	Venturi Scrubber	N/A	N/A	R	100-Hard Piped	95-Stack Test	Pressure	N/A	Daily	Semiannual	Per CAM Plan
CD – DE-416	R	VOC	Condenser	N/A	N/A	----	----	----	----	----	----	----	----
CD – DM-601	M	PM	Venturi Scrubber	N/A	N/A	R	100-Hard Piped	95-Stack Test	Flow	N/A	Continuous	Semiannual	Per CAM Plan
CD -													
CD -													
CD -													
CD -													
CD -													
CD -													



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**A. APPLICATION IDENTIFICATION**

1. Facility Name: BP Amoco Chemical Company - Cooper River Plant	
2. SC Air Permit Number (8-digits only): 0420 - 0029	3. Application Date: 4/09/2013-Revised 03/04/2014

**B. ATTACHMENTS**

1. <input checked="" type="checkbox"/> Sample Calculations, Emission Factors Used, etc.	2. <input type="checkbox"/> Detailed Explanation of Assumptions, Bottlenecks, etc.
3. <input type="checkbox"/> Supporting Information: Manufacturer's Data, etc.	4. <input type="checkbox"/> Source Test Information
5. <input type="checkbox"/> Details on Limits Being Taken for Limited Emissions	6. <input checked="" type="checkbox"/> NSR Analysis

**C. SUMMARY OF PROJECTED CHANGE IN FACILITY WIDE POTENTIAL EMISSIONS**

(Calculated at maximum design capacity.)

1. Pollutants	2. Emission Rates Prior to Construction / Modification (tons/year)			3. Emission Rates After Construction / Modification (tons/year)		
	Uncontrolled	Controlled	Limited	Uncontrolled	Controlled	Limited
Particulate Matter (PM)	5,617.2	81.8	----	5,396.9	77.1	----
Particulate Matter <10 Microns (PM <sub>10</sub> )	5,589.7	78.0	----	5,359.0	73.0	----
Particulate Matter <2.5 Microns (PM <sub>2.5</sub> )	5,522.7	73.8	----	5,264.4	67.9	----
Sulfur Dioxide (SO <sub>2</sub> )	193.8	189.1	----	193.8	189.1	----
Nitrogen Oxides (NO <sub>x</sub> )	475.9	324.6	----	475.9	324.6	----
Carbon Monoxide (CO)	17,113.9	2,533.8	----	14,619.4	1,040.3	----
Volatile Organic Compounds (VOC)	2,485.2	757.0	----	2,479.5	490.2	----
Lead (Pb)	1.0	1.0	----	1.0	1.0	----
Greenhouse Gases (Mass Basis)	487,767	512,580	----	482,000	479,586	----
Greenhouse Gases (CO <sub>2</sub> e Basis)	488,196	513,031	----	482,424	480,008	----
Highest HAP Prior to Construction (CAS #: 106-42-3 )	430.8	47.3	----	----	----	----
Highest HAP After Construction (CAS #: 106-42-3 )	----	----	----	227.9	58.5	----
Total HAP Emissions*	2,548.4	279.8	----	1688.1	128.6	----

(\*All HAP emitted from the various equipment or processes must be listed in the appropriate "Table D. Potential Emission Rates at Maximum Design Capacity.")



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<b>D. POTENTIAL EMISSION RATES AT MAXIMUM DESIGN CAPACITY</b>									
<b>1. Equipment ID / Process ID</b>	<b>2. Emission Point ID</b>	<b>3. Pollutants (Include CAS #.)</b>	<b>4. Calculation Methods / Limits Taken / Other Comments</b>	<b>5. Uncontrolled</b>		<b>6. Controlled</b>		<b>7. Limited</b>	
				<b>lbs/hr</b>	<b>tons/yr</b>	<b>lbs/hr</b>	<b>tons/yr</b>	<b>lbs/hr</b>	<b>tons/yr</b>
BM-1201	O-17	NO <sub>x</sub> 11104-93-1	See Appendix B	10.4	0.5	10.4	0.5		
BM-1201	O-17	VOC	See Appendix B	0.8	0.0	0.8	0.0		
BM-1201	O-17	CO 630-08-0	See Appendix B	2.2	0.1	2.2	0.1		
BM-1201	O-17	SO <sub>2</sub> 7446-09-5	See Appendix B	0.7	0.0	0.7	0.0		
BM-1201	O-17	PM	See Appendix B	0.7	0.0	0.7	0.0		
BM-1201	O-17	PM <sub>10</sub>	See Appendix B	0.7	0.0	0.7	0.0		
BM-1201	O-17	PM <sub>2.5</sub>	See Appendix B	0.7	0.0	0.7	0.0		
BM-1201	O-17	CO <sub>2</sub> e 124-38-9	See Appendix B	137.6	6.9	137.6	6.9		
#1 HPVGTS	O-2/10/15	VOC	See Appendix B	234	1025	4.7	20.5		
#1 HPVGTS	O-2/10/15	CO 630-08-0	See Appendix B	1758	7700	87.9	385.0		
#1 HPVGTS	O-2/10/15	CO <sub>2</sub> e 124-38-9	See Appendix B	9521	41,700	9521	41,700		
BT-603	O-3	VOC	See Appendix B	9.6	42.0	9.6	42.0		
BT-603	O-3	CO 630-08-0	See Appendix B	4.1	18.0	4.1	18.0		
BT-603	O-3	CO <sub>2</sub> e 124-38-9	See Appendix B	283.0	1240	283.0	1240		
BT-501	O-22	PM	See Appendix B	75	330	1.50	6.6		
BT-501	O-22	PM <sub>10</sub>	See Appendix B	75	330	1.50	6.6		
BT-501	O-22	PM <sub>2.5</sub>	See Appendix B	75	330	1.50	6.6		
#1 OX Fugitives	N/A	p-Xylene 106-42-3	See Appendix B	1.9	8.1	0.20	0.9		



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<b>D. POTENTIAL EMISSION RATES AT MAXIMUM DESIGN CAPACITY</b>									
<b>1. Equipment ID / Process ID</b>	<b>2. Emission Point ID</b>	<b>3. Pollutants (Include CAS #.)</b>	<b>4. Calculation Methods / Limits Taken / Other Comments</b>	<b>5. Uncontrolled</b>		<b>6. Controlled</b>		<b>7. Limited</b>	
				<b>lbs/hr</b>	<b>tons/yr</b>	<b>lbs/hr</b>	<b>tons/yr</b>	<b>lbs/hr</b>	<b>tons/yr</b>
#1 OX Fugitives	N/A	Formaldehyde 50-00-0	See Appendix B	0	0	0	0		
#1 OX Fugitives	N/A	Methanol 67-56-1	See Appendix B	0.01	0.02	0.001	0.002		
#1 OX Fugitives	N/A	Benzene 71-43-2	See Appendix B	0	0	0	0		
#1 OX Fugitives	N/A	Toluene 108-88-3	See Appendix B	0	0	0	0		
#1 OX Fugitives	N/A	Methyl Bromide 74-83-9	See Appendix B	0	0	0	0		
#1 OX Fugitives	N/A	Acetaldehyde 75-07-0	See Appendix B	0	0	0	0		
#1 OX Fugitives	N/A	Acetic Acid 64-19-7	See Appendix B	45.1	197.5	4.8	21.1		
DM-135	O2-10	NO <sub>x</sub> 11104-93-1	See Appendix B	25.75	6.44	25.75	6.44		
DM-135	O2-10	VOC	See Appendix B	0.69	0.17	0.69	0.17		
DM-135	O2-10	CO 630-08-0	See Appendix B	5.90	1.48	5.90	1.48		
DM-135	O2-10	SO <sub>2</sub> 7446-09-5	See Appendix B	0.43	0.11	0.43	0.11		
DM-135	O2-10	PM	See Appendix B	0.75	0.19	0.75	0.19		
DM-135	O2-10	PM <sub>10</sub>	See Appendix B	0.75	0.19	0.75	0.19		
DM-135	O2-10	PM <sub>2.5</sub>	See Appendix B	0.75	0.19	0.75	0.19		
DM-135	O2-10	CO <sub>2e</sub> 124-38-9	See Appendix B	440.8	110.2	440.8	110.2		
DB-1813	O2-2	NO <sub>x</sub> 11104-93-1	See Appendix B	1.47	6.4	1.47	6.4		
DB-1813	O2-2	VOC	See Appendix B	0.08	0.4	0.08	0.4		



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<b>D. POTENTIAL EMISSION RATES AT MAXIMUM DESIGN CAPACITY</b>									
<b>1. Equipment ID / Process ID</b>	<b>2. Emission Point ID</b>	<b>3. Pollutants (Include CAS #.)</b>	<b>4. Calculation Methods / Limits Taken / Other Comments</b>	<b>5. Uncontrolled</b>		<b>6. Controlled</b>		<b>7. Limited</b>	
				<b>lbs/hr</b>	<b>tons/yr</b>	<b>lbs/hr</b>	<b>tons/yr</b>	<b>lbs/hr</b>	<b>tons/yr</b>
DB-1813	O2-2	CO 630-08-0	See Appendix B	1.24	5.4	1.24	5.4		
DB-1813	O2-2	SO <sub>2</sub> 7446-09-5	See Appendix B	0.01	0.04	0.01	0.0		
DB-1813	O2-2	PM	See Appendix B	0.11	0.5	0.11	0.5		
DB-1813	O2-2	PM <sub>10</sub>	See Appendix B	0.11	0.5	0.11	0.5		
DB-1813	O2-2	PM <sub>2.5</sub>	See Appendix B	0.11	0.5	0.11	0.5		
DB-1813	O2-2	CO <sub>2</sub> e 124-38-9	See Appendix B	1755	7,687	175	7,687		
#2 HPVGTS	O2-3/4	VOC	See Appendix B	175.0	766.5	3.50	15.3		
#2 HPVGTS	O2-3/4	CO 630-08-0	See Appendix B	1500.0	6571.5	75.0	329.0		
#2 HPVGTS	O2-3/4	CO <sub>2</sub> e 124-38-9	See Appendix B	2300	10,074	2300	10,074		
DT-302	O2-1	VOC	See Appendix B	8.85	38.8	8.85	38.8		
DT-302	O2-1	CO 630-08-0	See Appendix B	3.47	15.2	3.47	15.2		
DT-302	O2-1	CO <sub>2</sub> e 124-38-9	See Appendix B	231.7	1,015	231.7	1,015		
DT-500	O2-5	PM	See Appendix B	10	50	0.10	0.5		
DT-500	O2-5	PM <sub>10</sub>	See Appendix B	10	50	0.10	0.5		
DT-500	O2-5	PM <sub>2.5</sub>	See Appendix B	10	50	0.10	0.5		
#2 OX Fugitives	N/A	p-Xylene 106-42-3	See Appendix B	2.2	9.4	0.2	1.0		
#2 OX Fugitives	N/A	Formaldehyde 50-00-0	See Appendix B	0	0	0	0		
#2 OX Fugitives	N/A	Methanol 67-56-1	See Appendix B	0.006	0.03	0.001	0.003		



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<b>D. POTENTIAL EMISSION RATES AT MAXIMUM DESIGN CAPACITY</b>									
<b>1. Equipment ID / Process ID</b>	<b>2. Emission Point ID</b>	<b>3. Pollutants (Include CAS #.)</b>	<b>4. Calculation Methods / Limits Taken / Other Comments</b>	<b>5. Uncontrolled</b>		<b>6. Controlled</b>		<b>7. Limited</b>	
				<b>lbs/hr</b>	<b>tons/yr</b>	<b>lbs/hr</b>	<b>tons/yr</b>	<b>lbs/hr</b>	<b>tons/yr</b>
#2 OX Fugitives	N/A	Benzene 71-43-2	See Appendix B	0	0	0	0		
#2 OX Fugitives	N/A	Toluene 108-88-3	See Appendix B	0	0	0	0		
#2 OX Fugitives	N/A	Methyl Bromide 74-83-9	See Appendix B	0	0	0	0		
#2 OX Fugitives	N/A	Acetaldehyde 75-07-0	See Appendix B	0	0	0	0		
#2 OX Fugitives	N/A	Acetic Acid 64-19-7	See Appendix B	46.2	202.5	4.8	21.2		
CM-301	P-2	VOC	See Appendix B	10.62	46.5	10.62	46.5		
CM-301	P-2	PM	See Appendix B	121	530	1.21	5.3		
CM-301	P-2	PM <sub>10</sub>	See Appendix B	121	530	1.21	5.3		
CM-301	P-2	PM <sub>2.5</sub>	See Appendix B	121	530	1.21	5.3		
CM-404 A/B	P-3 A/B	PM	See Appendix B	30 each	131.4 each	0.3 each	1.3 each		
CM-404 A/B	P-3 A/B	PM <sub>10</sub>	See Appendix B	30 each	131.4 each	0.3 each	1.3 each		
CM-404 A/B	P-3 A/B	PM <sub>2.5</sub>	See Appendix B	30 each	131.4 each	0.3 each	1.3 each		
CM-603 A/B	P-4 A/B	PM	See Appendix B	42.4 each	185.8 each	0.42 each	1.9 each		
CM-603 A/B	P-4 A/B	PM <sub>10</sub>	See Appendix B	42.4 each	185.8 each	0.42 each	1.9 each		
CM-603 A/B	P-4 A/B	PM <sub>2.5</sub>	See Appendix B	42.4 each	185.8 each	0.42 each	1.9 each		
CM-608 A/B	P-17/18	PM	See Appendix B	0.86 each	3.8 each	0.01 each	0.04 each		
CM-608 A/B	P-17/18	PM <sub>10</sub>	See Appendix B	0.86 each	3.8 each	0.01 each	0.04 each		
CM-608 A/B	P-17/18	PM <sub>2.5</sub>	See Appendix B	0.86 each	3.8 each	0.01 each	0.04 each		



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<b>D. POTENTIAL EMISSION RATES AT MAXIMUM DESIGN CAPACITY</b>									
<b>1. Equipment ID / Process ID</b>	<b>2. Emission Point ID</b>	<b>3. Pollutants (Include CAS #.)</b>	<b>4. Calculation Methods / Limits Taken / Other Comments</b>	<b>5. Uncontrolled</b>		<b>6. Controlled</b>		<b>7. Limited</b>	
				<b>lbs/hr</b>	<b>tons/yr</b>	<b>lbs/hr</b>	<b>tons/yr</b>	<b>lbs/hr</b>	<b>tons/yr</b>
CD-405	P-14	PM	See Appendix B	10	43.8	0.1	0.4		
CD-405	P-14	PM <sub>10</sub>	See Appendix B	10	43.8	0.1	0.4		
CD-405	P-14	PM <sub>2.5</sub>	See Appendix B	10	43.8	0.1	0.4		
DM-601	P2-2	VOC	See Appendix B	10.62	46.5	10.62	46.5		
DM-601	P2-2	PM	See Appendix B	54	236.5	0.54	2.4		
DM-601	P2-2	PM <sub>10</sub>	See Appendix B	54	236.5	0.54	2.4		
DM-601	P2-2	PM <sub>2.5</sub>	See Appendix B	54	236.5	0.54	2.4		
DD-500/DH-518	P2-1	PM	See Appendix B	4	17.5	0.04	0.2		
DD-500/DH-518	P2-1	PM <sub>10</sub>	See Appendix B	4	17.5	0.04	0.2		
DD-500/DH-518	P2-1	PM <sub>2.5</sub>	See Appendix B	4	17.5	0.04	0.2		
DM-704	P2-3	PM	See Appendix B	5.2	22.8	0.26	1.1		
DM-704	P2-3	PM <sub>10</sub>	See Appendix B	5.2	22.8	0.26	1.1		
DM-704	P2-3	PM <sub>2.5</sub>	See Appendix B	5.2	22.8	0.26	1.1		
DM-797 A/B	P2-4 A/B	PM	See Appendix B	265 each	1161 each	0.27 each	1.2 each		
DM-797 A/B	P2-4 A/B	PM <sub>10</sub>	See Appendix B	265 each	1161 each	0.27 each	1.2 each		
DM-797 A/B	P2-4 A/B	PM <sub>2.5</sub>	See Appendix B	265 each	1161 each	0.27 each	1.2 each		



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<b>A. APPLICATION IDENTIFICATION</b>		
1. Facility Name: BP Amoco Chemical Company - Cooper River Plant		
2. SC Air Permit Number (8-digits only): 0420 - 0029	3. Application Date: 4/09/2013 – Revised 3/04/2014	

<b>B. SOUTH CAROLINA AIR POLLUTION CONTROL REGULATIONS AND STANDARDS</b> (If not listed below add any additional regulations that are triggered.)					
1. Regulation	2. Applicable		Include all limits, work practices, monitoring, record keeping, etc.		
	Yes	No	3. Explain Applicability Determination	4. List the specific limitations and/or requirements that apply.	5. How will compliance be demonstrated?
Regulation 61-62.1, Section II(E) Synthetic Minor Construction Permits	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Major Source	N/A	N/A
Regulation 61-62.1, Section II(G) Conditional Major Operating Permits	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Title V Source	N/A	N/A
Regulation 61-62.5, Standard No. 1 Emissions from Fuel Burning Operations	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No new or modified fuel burn sources	N/a	N/A
Regulation 61-62.5, Standard No. 2 Ambient Air Quality Standards	<input checked="" type="checkbox"/>	<input type="checkbox"/>	No changes to PTE previously modeled, CO modeling below SIL	N/A	N/A
Regulation 61-62.5, Standard No. 3 Waste Combustion and Reduction	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No new or modified sources	N/A	N/A
Regulation 61-62.5, Standard No. 3.1 Hospital, Medical, Infections Waste Incinerators (HMIWI)	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No applicable sources at facility	N/A	N/A
Regulation 61-62.5, Standard No. 4 Emissions from Process Industries	<input checked="" type="checkbox"/>	<input type="checkbox"/>	PM sources- the PWR is unchanged	No Change from present	No Change from present
Regulation 61-62.5, Standard No. 5 Volatile Organic Compounds	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No new or modified sources	N/A	N/A
Regulation 61-62.5, Standard No. 5.1 BACT/LAER Applicable to VOC	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	VOC increase is less than 100 tpy per PSD analysis	N/A	N/A
Regulation 61-62.5, Standard No. 5.2 Control of Oxides of Nitrogen	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No new or modified sources	N/A	N/A
Regulation 61-62.5, Standard No. 7 Prevention of Significant Deterioration	<input checked="" type="checkbox"/>	<input type="checkbox"/>	PSD Permit application		
Regulation 61-62.5, Standard No. 7.1 Nonattainment New Source Review	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Not a non-attainment area	N/A	N/A
Regulation 61-62.5, Standard No. 8 Toxic Air Pollutants	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Exempt per section 1(d) since all sources covered by a MACT	N/A	N/A





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<b>B. SOUTH CAROLINA AIR POLLUTION CONTROL REGULATIONS AND STANDARDS</b>					
(If not listed below add any additional regulations that are triggered.)					
1. Regulation	2. Applicable		Include all limits, work practices, monitoring, record keeping, etc.		
	Yes	No	3. Explain Applicability Determination	4. List the specific limitations and/or requirements that apply.	5. How will compliance be demonstrated?
Regulation 61-62.6 Control of Fugitive Particulate Matter	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No new or modified sources	N/A	N/A
Regulation 61-62.68 Chemical Accident Prevention Provisions	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No new or modified sources	N/A	N/A
Regulation 61-62.70 Title V Operating Permit Program	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Title V Modification	Revise Title V permit	Submit application
Regulation 61-62.72 Acid Rain	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No new or modified sources	N/A	N/A
Regulation 61-62.96 Nitrogen Oxides Budget Trading Program	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No new or modified sources	N/A	N/A
Regulation 61-62.99 Nitrogen Oxides Budget Program Requirements for Stationary Sources Not In the Trading Program	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No new or modified sources	N/A	N/A

<b>C. 40 CFR PART 60 - STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES</b>					
(If not listed below add any additional regulations that are triggered.)					
1. Subpart and Title	2. Applicable		Include all limits, work practices, monitoring, record keeping, etc.		
	Yes	No	3. Explain Applicability Determination	4. List the specific limitations and/or requirements that apply.	5. How will compliance be demonstrated?
Subpart A - General Provisions	<input checked="" type="checkbox"/>	<input type="checkbox"/>	New or modified sources subject		
NNN	<input checked="" type="checkbox"/>	<input type="checkbox"/>	New sources	Maintain TRE from recovery device above 8	Monitor recovery per regulation to maintain TRE
III	<input checked="" type="checkbox"/>	<input type="checkbox"/>	New reactor on #1 OX	Maintain TRE from recovery device above 4	Monitor recovery per regulation to maintain TRE
VV	<input checked="" type="checkbox"/>	<input type="checkbox"/>	New components	Will comply by HON LDAR	HON LDAR monitoring
VVa	<input type="checkbox"/>	<input type="checkbox"/>	New components	Will comply by HON LDAR	HON LDAR monitoring
	<input type="checkbox"/>	<input type="checkbox"/>			
	<input type="checkbox"/>	<input type="checkbox"/>			
	<input type="checkbox"/>	<input type="checkbox"/>			
	<input type="checkbox"/>	<input type="checkbox"/>			



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**D. 40 CFR PART 61 - NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS**

(If not listed below add any additional regulations that are triggered.)

1. Subpart and Title	2. Applicable		Include all limits, work practices, monitoring, record keeping, etc.		
	Yes	No	3. Explain Applicability Determination	4. List the specific limitations and/or requirements that apply.	5. How will compliance be demonstrated?
Subpart A - General Provisions	<input type="checkbox"/>	<input checked="" type="checkbox"/>	No new or modified sources	N/A	N/A
M	<input type="checkbox"/>	<input type="checkbox"/>	General for facility demo work	Proper handling of asbestos	Proper handling methods
FF	<input type="checkbox"/>	<input type="checkbox"/>	Need to re-evaluate TAB	Re-evaluate TAB < 1 Mg	TAB calculation
	<input type="checkbox"/>	<input type="checkbox"/>			
	<input type="checkbox"/>	<input type="checkbox"/>			

**E. 40 CFR PART 63 - NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS FOR SOURCE CATEGORIES**

(If not listed below add any additional regulations that are triggered.)

1. Subpart and Title	2. Applicable		Include all limits, work practices, monitoring, record keeping, etc.		
	Yes	No	3. Explain Applicability Determination	4. List the specific limitations and/or requirements that apply.	5. How will compliance be demonstrated?
Subpart A - General Provisions	<input checked="" type="checkbox"/>	<input type="checkbox"/>	New or modified sources		
F	<input checked="" type="checkbox"/>	<input type="checkbox"/>	New or modified sources		
G	<input checked="" type="checkbox"/>	<input type="checkbox"/>	New or modified sources	Maintain TRE of process vents	Monitor per HON regulation
H	<input checked="" type="checkbox"/>	<input type="checkbox"/>	New or modified sources	Have a LDAR program	Monitor & Report per HON
DDDDD	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Applicable to equipment but no new or modified sources	No new limits or requirements	Burn only gas
GGGGG	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Will be triggered if remediation occurs due to project	Comply with appropriate standards	Meet appropriate monitoring and reporting requirement of regulation
	<input type="checkbox"/>	<input type="checkbox"/>			
	<input type="checkbox"/>	<input type="checkbox"/>			

**F. OTHER**

(If not listed below add any additional regulations, enforcement requirement, permitting requirement, etc. that are triggered.)

1. Regulation and Title / Other	2. Applicable		Include all limits, work practices, monitoring, record keeping, etc.		
	Yes	No	3. Explain Applicability Determination	4. List the specific limitations and/or requirements that apply.	5. How will compliance be demonstrated?
40 CFR Part 64 - Compliance Assurance Monitoring (CAM)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	New or modified sources	Update CAM plan as necessary	Monitor per CAM plan & report
	<input type="checkbox"/>	<input type="checkbox"/>			



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**A. APPLICATION IDENTIFICATION**

1. Facility Name: BP Amoco Chemical Company - Cooper River Plant	
2. SC Air Permit Number (if known; 8-digits only): 0420 - 0029	3. Application Date: 4/09/2013 – Revised 3/04/2014
4. Project Description: BP CR Modernization/Debottleneck Project	

**B. FACILITY INFORMATION**

1. Is your company a Small Business? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	2. If a Small Business, is Bureau modeling assistance being requested? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
3. Are other facilities co-modeled? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	4. If Yes, provide permit numbers of co-modeled facilities:

**C. AIR MODELING CONTACT**

Consulting Firm Name (if applicable): TRC Environmental			
Title/Position: Senior Environmental Specialist	Salutation: Mr.	First Name: David	Last Name: Fox
Mailing Address: Suite 3000 708 Heartland Trail			
City: Madison		State: Wi	Zip Code: 53717
E-mail Address: DFox@trcsolutions.com		Phone No.: 608-826-3622	Cell No.: 608-216-8986

**D. REASON FOR MODELING**

(Check all that apply.)

1. <input type="checkbox"/> Modeling Not Required Explanation:									
2. Modeling/Pollutant	Particulate Matter <10 Microns (PM <sub>10</sub> )	Particulate Matter <2.5 Microns (PM <sub>2.5</sub> )	Sulfur Dioxide (SO <sub>2</sub> )	Nitrogen Oxides (NO <sub>x</sub> )	Carbon Monoxide (CO)	Lead (Pb)	Hydrogen Fluoride (HF)	Air Toxics	Other
Not Modeled	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Standard 2 AAQS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	N/A	<input type="checkbox"/>
Standard 2 Exemption/Deferral	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	N/A	<input type="checkbox"/>
Standard 7 Increment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	N/A	N/A	N/A	N/A	<input type="checkbox"/>
Standard 7 Exemption/Deferral	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	N/A	N/A	N/A	N/A	<input type="checkbox"/>
Standard 8 Air Toxics	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<input type="checkbox"/>	<input type="checkbox"/>
Standard 8 De Minimis / Exempt	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<input type="checkbox"/>	<input type="checkbox"/>
NSR/PSD Project	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Air Compliance Demonstration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. "Other" Reason for modeling
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**E. EMISSION SOURCE DISPERSION PARAMETERS**

Source data requirements are based on the appropriate source classification. Each emission source is classified as a point, area, volume, or flare source. Contact the Bureau of Air Quality for clarification of input data requirements. Include source on-site map. Also, a picture of area or volume sources would be helpful but is not required. A spreadsheet may be substituted in lieu of this form provided the required emission point parameters are submitted in the same order as presented in these tables.

Abbreviations / Units of Measure: UTM = Universal Transverse Mercator; °N = Degrees North; °W = Degrees West; m = meters; AGL = Above Ground Level; ft = feet; ft/s = feet per second; ° = Degrees; °F = Degrees Fahrenheit

**F. POINT SOURCE DATA**

(Point sources such as stacks, chimneys, exhaust fans, and vents.)

Emission Point ID	Description/Name	Stack Coordinates Projection: UTM83				Release Height AGL (ft)	Temp. (°F)	Exit Velocity (ft/s)	Inside Diameter (ft)	Discharge Orientation	Rain Cap? (Y/N)	Distance To Nearest Property Boundary (ft)	Building		
		UTM E (m)	UTM N (m)	Lat (°N)	Long (°W)								Height (ft)	Length (ft)	Width (ft)
BT_702	BT-702 DHT Scrubber	604625	3649190			35.00	90	69.9	1.00	V	N	964	54	62	51
BT_603	#1 OX LPA	604639	3649127			70.5	120	11.2	2.50	V	N	907	54	62	51
HPVGTS1	#1 OX HPVGTS	604666.1	3649104.3			100.0	171	261.7	3.0	V	N	878	54	62	51
DT_302	#2 OX LPA	604565	3648820			80.0	95	3.2	3.5	V	N	590	32	44	29
HPVGTS2	#2 OX HPVGTS	604642.3	3648895.9			136.0	140	98.0	4.26	V	N	667	32	44	29

**G. AREA SOURCE DATA**

(Area sources such as storage piles, and other sources that have low level or ground level releases with no plumes.)

Emission Point ID	Description/Name	Area Source Coordinates Projection:				Release Height AGL (ft)	Easterly Length (ft)	Northerly Length (ft)	Angle From North (°)	Distance To Nearest Property Boundary (ft)
		UTM E (m)	UTM N (m)	Lat (°N)	Long (°W)					
NA										

**H. VOLUME SOURCE DATA**

(Volume sources that have initial dispersion prior to release. Volume sources differ from area sources in that they have an initial dispersion vertical depth.)

Emission Point ID	Description/Name	Volume Source Coordinates Projection:				Release Height AGL (ft)	Initial Horizontal Dimension (ft)	Initial Vertical Dimension (ft)	Distance To Nearest Property Boundary (ft)
		UTM E (m)	UTM N (m)	Lat (°N)	Long (°W)				
NA									

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**I. FLARE SOURCE DATA**

(Point sources where the combustion takes place at the tip of the stack.)

Emission Point ID	Description/Name	Stack Coordinates Projection:				Release Height AGL (ft)	Heat Release Rate (BTU/hr)	Distance To Nearest Property Boundary (ft)	Building		
		UTM E (m)	UTM N (m)	Lat (°N)	Long (°W)				Height (ft)	Length (ft)	Width (ft)
NA											

**J. AREA CIRCULAR SOURCE DATA**

Emission Point ID	Description/Name	Area Circular Source Coordinates Projection:				Release Height AGL (ft)	Radius of Area (ft)	Distance To Nearest Property Boundary (ft)
		UTM E (m)	UTM N (m)	Lat (°N)	Long (°W)			
NA								

**K. AREA POLY SOURCE DATA**

Emission Point ID	Description/Name	Area Poly Source Coordinates Projection:				Release Height AGL (ft)	Number of Vertices
		UTM E (m)	UTM N (m)	Lat (°N)	Long (°W)		
NA				NA (See Instructions)			

**L. OPEN PIT SOURCE DATA**

Emission Point ID	Description/Name	Open Pit Source Coordinates Projection:				Release Height AGL (ft)	Easterly Length (ft)	Northerly Length (ft)	Volume (ft <sup>3</sup> )	Angle From North (°)
		UTM E (m)	UTM N (m)	Lat (°N)	Long (°W)					
NA				NA (See Instructions)						



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M. MODELED EMISSION RATES						
Emission Point ID	Pollutant Name	CAS #	Emission Rate (lb/hr)	Same as Permitted <sup>(1)</sup>	Controlled or Uncontrolled	Averaging Period
BT-702	CO		-87.0	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Controlled	1,8
BT-603	CO		4.1	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Controlled	1,8
#1 HPVGTS	CO		87.9	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Controlled	1,8
DT-302	CO		3.5	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Controlled	1,8
#2 HPVGTS	CO		75.0	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Controlled	1,8
				<input type="checkbox"/> Yes <input type="checkbox"/> No		
				<input type="checkbox"/> Yes <input type="checkbox"/> No		
				<input type="checkbox"/> Yes <input type="checkbox"/> No		
				<input type="checkbox"/> Yes <input type="checkbox"/> No		
				<input type="checkbox"/> Yes <input type="checkbox"/> No		

(1) Any difference between the modeled rate and the permitted rate must be explained in the modeling report.

# Appendix B

## Emission Data and Calculations

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## PSD Analysis



Table B-1  
Project Dragonslayer PSD Emissions Analysis Summary

**Post-Project PTE Emissions (Before BACT) (tpy)**

POLLUTANTS	CR #1 OX	CR #2 OX	CR #1 PTA	CR #2 PTA	COOLING TOWER	TANK FARM <sup>(1)</sup>	SHIPPING <sup>(1)</sup>	INC. STEAM <sup>(1)</sup>	TOTAL
NOx	0.5	12.9	0	0	0	0	0	17.3	30.7
VOC	157.0	150.3	46.5	46.5	0	1.3	0	1.2	402.8
CO	403.1	351.1	0	0	0	0	0	17.8	771.9
SO <sub>2</sub>	0.03	0.1	0	0	0	0	0	0.1	0.3
PM	6.6	1.1	12.1	6.0	3.8	0	9.9	1.1	40.7
PM <sub>10</sub>	6.6	1.1	12.1	6.0	2.8	0	9.9	1.1	39.6
PM <sub>2.5</sub>	6.6	1.1	12.1	6.0	0.01	0	9.9	1.1	36.9
CO <sub>2</sub> e	42,947	18,886	0	0	0	0	0	25,265	87,098

<sup>(1)</sup> These units will not be modified. Tank Farm and Shipping are debottlenecked and incremental steam from boiler.

**Baseline Actual Average 2010-2011 Emissions (tpy)**

POLLUTANTS	CR #1 OX	CR #2 OX	CR #1 PTA	CR #2 PTA	COOLING TOWER	TANK FARM	SHIPPING	INC. STEAM	TOTAL
NOx	0.2	2.9	0	0	0	0	0	0	3.1
VOC	124.7	111.9	40.1	42.0	0	1.2	0	0	319.9
CO	275.1	71.6	0	0	0	0	0	0	346.7
SO <sub>2</sub>	0.01	0.03	0	0	0	0	0	0	0.04
PM	3.3	0.6	12.9	5.4	2.7	0	8.8	0	33.7
PM <sub>10</sub>	3.3	0.6	12.9	5.4	1.9	0	8.8	0	33.0
PM <sub>2.5</sub>	3.4	0.6	12.9	5.4	0.01	0	8.8	0	31.1
CO <sub>2</sub> e	38,807	30,987	0	0	0	0	0	0	69,793

**Step 1 - Project Pollutant Increases Above PSD Significance**

POLLUTANTS	VOC	CO	NOx	SO <sub>2</sub>	PM	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2</sub> e
TOTAL PTE	402.8	771.9	30.7	0.3	40.7	39.6	36.9	87,098
TOTAL BASELINE	319.9	346.7	3.1	0.04	33.7	33.0	31.1	69,793
DELTA	82.9	425.2	27.6	0.3	7.0	6.7	5.8	17,304
PSD SIGNIFICANCE	40	100	40	40	25	15	10	75,000
ABOVE PSD	Yes	Yes	No	No	No	No	No	No

Table B-1  
Project Dragonslayer PSD Emissions Analysis Summary

**Step 2 - Facility Netting**

POLLUTANTS	VOC	CO	NOx	SO <sub>2</sub>	PM	PM <sub>10</sub>	PM <sub>2.5</sub>	CO <sub>2e</sub>
STEP 1 DELTA	82.9	425.2	27.6	0.3	7.0	6.7	5.8	17304.2
TOTAL CONTEMPORANEOUS	35.8	26.9	N/A	N/A	N/A	N/A	N/A	N/A
NET EMISSIONS	118.8	452.1	27.6	0.3	7.0	6.7	5.8	17304.2
PSD SIGNIFICANCE	40	100	40	40	25	15	10	75,000
ABOVE PSD	Yes	Yes	No	No	No	No	No	No

**Contemporaneous Emissions**

PROJECT	YEAR	CO (tpy)	VOC (tpy)
502b10 - CR #1 Ox BR-301A Alternate Water Withdrawal	2008	0.0	0
PTA FIP Project (Permit CS)	2008	0.01	8.24
502b10 - #1 OX/PTA Op Flex	2011	0	0
PTA BHS Filter Project	2012	26.9	27.6
Total	---	26.9	35.8

**Post-Project PTE Emissions (After BACT) (tpy)**

POLLUTANTS	CR #1 OX	CR #2 OX	CR #1 PTA	CR #2 PTA	COOLING TOWER	TANK FARM <sup>(1)</sup>	SHIPPING <sup>(1)</sup>	INC. STEAM <sup>(1)</sup>	TOTAL
NOx	0.5	12.9	0	0	0	0	0	17.3	30.7
VOC	84.5	76.8	46.5	46.5	0	1.3	0	1.2	256.8
CO	403.1	351.1	0	0	0	0	0	17.8	771.9
SO <sub>2</sub>	0.0	0.1	0	0	0	0	0	0.1	0.3
PM	6.6	1.1	12.1	6.0	3.8	0	9.9	1.1	40.7
PM <sub>10</sub>	6.6	1.1	12.1	6.0	2.8	0	9.9	1.1	39.6
PM <sub>2.5</sub>	6.6	1.1	12.1	6.0	0.01	0	9.9	1.1	36.9
CO <sub>2e</sub>	42,947	18,886	0	0	0	0	0	25265.0	87,098

<sup>(1)</sup> These units will not be modified. Tank Farm and Shipping are debottlenecked and incremental steam from boiler.

Table B-2  
CR #1 OX PSD Analysis

PTE

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM FIRE RATE (HP)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR	UNITS	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Emergency Generator #2	BM-1201	335	NOx	0.031	lb/hp-hr	AP-42 3.3 (10/96)	10.385	100	0.5	Diesel Fuel Sulfur = 0.05%, Hours per RICE MACT limit
			VOC	0.00251	lb/hp-hr	AP-42 3.3 (10/96)	0.842	100	0.04	
			CO	0.00668	lb/hp-hr	AP-42 3.3 (10/96)	2.238	100	0.1	
			SO <sub>2</sub>	0.00205	lb/hp-hr	AP-42 3.3 (10/96)	0.687	100	0.03	
			PM	0.0022	lb/hp-hr	AP-42 3.3 (10/96)	0.737	100	0.04	
			PM <sub>10</sub>	0.0022	lb/hp-hr	AP-42 3.3 (10/96)	0.737	100	0.04	
			PM <sub>2.5</sub>	0.0022	lb/hp-hr	AP-42 3.3 (10/96)	0.737	100	0.04	
			CO <sub>2</sub> e	163.6	lb/MMBtu	USEPA Data	137.634	100	6.9	
EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (lb/hr)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR	UNITS	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
HPVGTS	HPVGTS-1	234	VOC	98.0	% Removal	BP Calcs/BACT Limit	4.7	8,760	20.5	Maximum rate based on BP design calculations & Requested BACT Limit
		1758	CO	95.0	% Removal		87.9	8,760	385.0	
		9520.6	CO <sub>2</sub> e	0	% Removal	BP calc/USEPA EF	9,520.6	8,760	41,700	
Low Pressure Absorber	BT-603	9.6	VOC			BP Calcs/BACT Limit	9.6	8,760	42.0	Maximum rate based on BP design calculations & Requested BACT Limits
		4.1	CO				4.1	8,760	18.0	
		283.0	CO <sub>2</sub> e			BP calc/USEPA EF	283.0	8,760	1240	
CRU Extraction Drum	BD-625	CRU removed	VOC							CRU is being removed
CRU Surge Drum	BD-631		VOC							
CRU Waste Slurry Drum	BD-632		VOC							
Silo Scrubber	BT-501	75	PM	98	% Removal	Average of data from 2/03 & 11/02 source tests	1.50	8,760	6.6	Maximum rate based on hourly emissions and % removal
			PM <sub>10</sub>	98	% Removal		1.50	8,760	6.6	
			PM <sub>2.5</sub>	98	% Removal		1.50	8,760	6.6	
CRU Evaporator Overhd Condenser	BE-645	CRU removed	VOC							CRU being removed
DHT Ovhd Scrubber	BT-702	Vent Removed	VOC							Vent Removed
			CO							
			CO <sub>2</sub> e							
Process Fugitives			VOC			USEPA LDAR EF	21.5	8,760	94.4	

Table B-2  
CR #1 OX PSD Analysis

2010 Actuals										
EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM FIRE RATE (HP)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR	UNITS	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	ACTUAL OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Emergency Generator #2	BM-1201	335	NOx	0.031	lb/hp-hr	AP-42 3.3 (10/96)	10.385	33	0.2	Diesel Fuel Sulfur = 0.05%
			VOC	0.00251	lb/hp-hr	AP-42 3.3 (10/96)	0.842	33	0.01	
			CO	0.00668	lb/hp-hr	AP-42 3.3 (10/96)	2.238	33	0.04	
			SO <sub>2</sub>	0.00205	lb/hp-hr	AP-42 3.3 (10/96)	0.687	33	0.01	
			PM	0.0022	lb/hp-hr	AP-42 3.3 (10/96)	0.737	33	0.01	
			PM <sub>10</sub>	0.0022	lb/hp-hr	AP-42 3.3 (10/96)	0.737	33	0.01	
			PM <sub>2.5</sub>	0.0022	lb/hp-hr	AP-42 3.3 (10/96)	0.737	33	0.01	
			CO <sub>2</sub> e	163.6	lb/MMBtu	USEPA Data	137.634	33	2.3	
EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (lb/hr)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR	UNITS	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	ACTUAL OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
HPVGTS	HPVGTS-1		VOC			Emission Inventory	3	8,291	13.5	
			CO				77	8,291	319.8	
			CO <sub>2</sub> e			BP calcs/EPA EF	9504	8,291	39,398.4	
Low Pressure Absorber	BT-603		VOC			Emission Inventory	5	8,291	22.0	
			CO				1	8,291	3.9	
			CO <sub>2</sub> e			BP calcs/EPA EF	110	8,291	457.2	
CRU Extraction Drum	BD-625		VOC			Emission Inventory	1.0	8,291	4.1	
CRU Surge Drum	BD-631		VOC			Emission Inventory	4.0	8,291	16.6	
CRU Waste Slurry Drum	BD-632		VOC			Emission Inventory	0.003	8,291	0.01	
Silo Scrubber	BT-501		PM	98	% Removal	Average of data from 12/14/04 source test	0.84	8,291	3.5	
			PM <sub>10</sub>	98	% Removal		0.84	8,291	3.5	
			PM <sub>2.5</sub>	98	% Removal		0.84	8,291	3.5	
CRU Evaporator Overhd Condenser	BE-645		VOC			Emission Inventory	0.3	8,291	1.2	
DHT Ovhd Scrubber	BT-702		VOC			Emission Inventory	20.6	62	0.6	Based on hours vent open
			CO				76.5	62	2.4	
			CO <sub>2</sub> e			BP calcs/EPA EF	534.1	62	16.6	
Process Fugitives			VOC			USEPA LDAR EF	19.8	8,291	82.1	

Table B-2  
CR #1 OX PSD Analysis

2011 Actuals

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM FIRE RATE (HP)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR	UNITS	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	ACTUAL OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Emergency Generator #2	BM-1201	335	NOx	0.031	lb/hp-hr	AP-42 3.3 (10/96)	10.385	44	0.2	Diesel Fuel Sulfur = 0.05%
			VOC	0.00251	lb/hp-hr	AP-42 3.3 (10/96)	0.842	44	0.02	
			CO	0.00668	lb/hp-hr	AP-42 3.3 (10/96)	2.238	44	0.05	
			SO <sub>2</sub>	0.00205	lb/hp-hr	AP-42 3.3 (10/96)	0.687	44	0.02	
			PM	0.0022	lb/hp-hr	AP-42 3.3 (10/96)	0.737	44	0.02	
			PM <sub>10</sub>	0.0022	lb/hp-hr	AP-42 3.3 (10/96)	0.737	44	0.02	
			PM <sub>2.5</sub>	0.0022	lb/hp-hr	AP-42 3.3 (10/96)	0.737	44	0.02	
			CO <sub>2</sub> e	163.6	lb/MMBtu	USEPA Data	137.634	44	3.0	
EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (lb/hr)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR	UNITS	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	ACTUAL OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
HPVGTS	HPVGTS-1		VOC			Emission Inventory	3	7,608	10.3	
			CO			Emission Inventory	58	7,608	219.9	
			CO <sub>2</sub> e			BP calcs/EPA EF	9800	7,608	37,278.5	
Low Pressure Absorber	BT-603		VOC			Emission Inventory	1	7,608	3.0	
			CO			Emission Inventory	1	7,608	2.7	
			CO <sub>2</sub> e			BP calcs/EPA EF	117	7,608	446.5	
CRU Extraction Drum	BD-625		VOC			Emission Inventory	1.0	7,608	3.8	
CRU Surge Drum	BD-631		VOC			Emission Inventory	4.0	7,608	15.2	
CRU Waste Slurry Drum	BD-632		VOC			Emission Inventory	0.003	7,608	0.01	
Silo Scrubber	BT-501		PM	98	% Removal	Average of data from 12/14/04 source test	0.84	7,608	3.2	
			PM <sub>10</sub>	98	% Removal		0.84	7,608	3.2	
			PM <sub>2.5</sub>	98	% Removal		0.84	7,608	3.2	
CRU Evaporator Overhd Condenser	BE-645		VOC			Emission Inventory	0.3	7,608	1.1	
DHT Ovhd Scrubber	BT-702		VOC			Emission Inventory	14.5	59	0.4	Based on hours vent open
			CO			Emission Inventory	54.7	59	1.6	
			CO <sub>2</sub> e			BP calcs/EPA EF	379.5	59	11.2	
Process Fugitives			VOC			USEPA LDAR EF	19.8	7,608	75.4	

TOTAL EMISSIONS - #1 OX PTE (tpy)				
POLLUTANT	PROCESS SOURCES	COMBUSTION SOURCES	FUGITIVE SOURCES	TOTALS
NOx	0	0.5	N/A	0.5
VOC	62.5	0.04	94.4	157.0
CO	403.0	0.1	N/A	403.1
SO <sub>2</sub>	0	0.03	N/A	0.03
PM	6.6	0.04	N/A	6.6
PM <sub>10</sub>	6.6	0.04	N/A	6.6
PM <sub>2.5</sub>	6.6	0.04	N/A	6.6
CO <sub>2</sub> e	42,939.8	6.9	N/A	42,946.7

TOTAL EMISSIONS - #1 OX BASELINE ACTUAL (tpy)				
POLLUTANT	PROCESS SOURCES	COMBUSTION SOURCES	FUGITIVE SOURCES	TOTALS
NOx	0	0.2	N/A	0.2
VOC	46.0	0.02	78.7	124.7
CO	275.1	0.04	N/A	275.1
SO <sub>2</sub>	0	0.01	N/A	0.01
PM	3.3	0.01	N/A	3.3
PM <sub>10</sub>	3.3	0.01	N/A	3.3
PM <sub>2.5</sub>	3.3	0.01	N/A	3.4
CO <sub>2</sub> e	38,804.2	2.6	N/A	38,806.8

POLLUTANT	THRESHOLD	DELTA (PTE - ACTUAL)
NOx	40	0.3
VOC	40	32.2
CO	100	128.0
SO <sub>2</sub>	40	0.02
PM	25	3.3
PM <sub>10</sub>	15	3.3
PM <sub>2.5</sub>	10	3.3
CO <sub>2</sub> e	75,000	4,139.9

Table B-3  
#2 OX PSD Analysis

PTE

			NATURAL GAS						DIESEL FUEL (SULFUR = 0.05%)				
EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM FIRE RATE	POLLUTANT EMITTED	AP-42 1.4 FACTOR (lb/MM scf)	NATURAL GAS EF (lb/MMBtu)	HOURLY EMISSION (lb/hr)	PERMIT OPERATE (hpy)	ANNUAL EMISSION (tpy)	AP-42 FACTOR (lb/hp-hr)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMIT OPERATE (hpy)*	Annual Emission (tpy) - Oil
Emergency Generator #3	DM-135	1072.8	NOx						0.024	AP-42 3.4 (10/96)	25.75	500	6.44
			VOC						0.000642	AP-42 3.4 (10/96)	0.69	500	0.17
			CO						0.0055	AP-42 3.4 (10/96)	5.90	500	1.48
		hp	SO <sub>2</sub>						0.00040	AP-42 3.4 (10/96)	0.43	500	0.11
			PM						0.0007	AP-42 3.4 (10/96)	0.75	500	0.19
			PM <sub>10</sub>						0.0007	AP-42 3.4 (10/96)	0.75	500	0.19
			PM <sub>2.5</sub>						0.0007	AP-42 3.4 (10/96)	0.75	500	0.19
			CO <sub>2</sub> e						163.6	lb/MMBtu-USEPA	440.76	500	110.19
HPVGTS Heater	DB-1813	15.0	NOx	100	0.098	1.47	8,760	6.4					
			VOC	5.5	0.005	0.08	8,760	0.4					
			CO	84	0.082	1.24	8,760	5.4					
		MMBtu/hr	SO <sub>2</sub>	0.6	0.001	0.01	8,760	0.04					
			PM	7.6	0.007	0.11	8,760	0.5					
			PM <sub>10</sub>	7.6	0.007	0.11	8,760	0.5					
			PM <sub>2.5</sub>	7.6	0.007	0.11	8,760	0.5					
			CO <sub>2</sub> e	----	117.000	1755.00	8,760	7,687.0					
EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (lb/hr)	POLLUTANT EMITTED	POLLUTANT EF (% Removal)	EMISSION FACTOR REFERENCE	HOURLY EMISSION (lb/hr)	PERMIT OPERATE (hpy)	ANNUAL EMISSION (tpy)	COMMENTS				
HPVGTS	DR-1814/ DT-1821	175	VOC	98%	BP Calcs/BACT Limit	3.50	8,760	15.3	Maximum rate based on BP design calculations & requested BACT limits				
		1500	CO	95%		75.0	8,760	329.0					
		2300	CO <sub>2</sub> e	0	BP calc/USEPA EF	2300	8,760	10,074					
Low Pressure Absorber	DT-302	8.85	VOC		BP Calcs/BACT Limit	8.85	8,760	38.8	Maximum rate based on BP design calculations & requested BACT limits				
		3.47	CO			3.47	8,760	15.2					
		231.7	CO <sub>2</sub> e		BP calc/USEPA EF	231.7	8,760	1,015					
Intermediate Silo Scrubber	DT-500	10.4	PM	99	BP Calcs	0.10	8,760	0.5	Maximum rate based on hourly emissions and % removal and application for #2 unit (permit CF)				
			PM <sub>10</sub>	99	BP Calcs	0.10	8,760	0.5					
			PM <sub>2.5</sub>	99	BP Calcs	0.10	8,760	0.5					
CRU Extraction Drum	DD-412	CRU removed	VOC						CRU is being removed				
CRU Waste Slurry Drum	DD-413		VOC										
CRU Mother Liquor Drum	DD-414		VOC										
CRU Evaporation Drum	DE-416		VOC										
Process Fugitives			VOC		USEPA LDAR EF	5.06	8,760	95.7					

\* Hours of operation of DM-135 based on Title V permit limit.

Table B-3  
#2 OX PSD Analysis

2010 Actuals

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM FIRE RATE	POLLUTANT EMITTED	NATURAL GAS					DIESEL FUEL (SULFUR = 0.05%)				
				AP-42 1.4 FACTOR (lb/MM scf)	NATURAL GAS EF (lb/MMBtu)	HOURLY EMISSION (lb/hr)	ACTUAL OPERATE (hpy)	ANNUAL EMISSION (tpy)	AP-42 FACTOR (lb/hp-hr)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	ACTUAL OPERATE (hpy)	ANNUAL EMISSION (tpy) - OIL
Emergency Generator #3	DM-135	1072.8	NOx						0.024	AP-42 3.4 (10/96)	25.75	61	0.79
			VOC						0.000642	AP-42 3.4 (10/96)	0.69	61	0.02
			CO						0.0055	AP-42 3.4 (10/96)	5.90	61	0.18
		hp	SO <sub>2</sub>						0.00040	AP-42 3.4 (10/96)	0.43	61	0.01
			PM						0.0007	AP-42 3.4 (10/96)	0.75	61	0.02
			PM <sub>10</sub>						0.0007	AP-42 3.4 (10/96)	0.75	61	0.02
			PM <sub>2.5</sub>						0.0007	AP-42 3.4 (10/96)	0.75	61	0.02
			CO <sub>2</sub> e						163.6	lb/MMBtu-USEPA	440.76	61	13.44
HPVGTS Heater	DB-1813	4.64	NOx	100	0.098	0.45	8,083	1.8					
			VOC	5.5	0.005	0.03	8,083	0.1					
			CO	84	0.082	0.38	8,083	1.5					
		MMBtu/hr	SO <sub>2</sub>	0.6	0.001	0.00	8,083	0.01					
			PM	7.6	0.007	0.03	8,083	0.1					
			PM <sub>10</sub>	7.6	0.007	0.03	8,083	0.1					
			PM <sub>2.5</sub>	7.6	0.007	0.03	8,083	0.1					
			CO <sub>2</sub> e	----	117.000	542.50	8,083	2192.5					
EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (lb/hr)	POLLUTANT EMITTED	POLLUTANT EF (% Removal)	EMISSION FACTOR REFERENCE	HOURLY EMISSION (lb/hr)	ACTUAL OPERATE (hpy)	ANNUAL EMISSION (tpy)	COMMENTS				
HPVGTS	DR-1814/ DT-1821		VOC		Emission Inventory	2.56	8,096	10.4					
			CO			18.13	8,096	73.4					
			CO <sub>2</sub> e		BP calcs/EPA EF	4707.58	8,096	19056.3					
Low Pressure Absorber	DT-302		VOC		Emission Inventory	4.70	8,096	19.0					
			CO			0.02	8,096	0.1					
			CO <sub>2</sub> e		BP calcs/EPA EF	6.25	8,096	25.3					
Intermediate Silo Scrubber	DT-500	10	PM	99	BP Calcs	0.10	8,096	0.4	Maximum rate based on hourly emissions and % removal				
			PM <sub>10</sub>	99	BP Calcs	0.10	8,096	0.4					
			PM <sub>2.5</sub>	99	BP Calcs	0.10	8,096	0.4					
CRU Extraction Drum	DD-412		VOC		BP Calcs	0.00	8,096	0.02					
CRU Waste Slurry Drum	DD-413		VOC		BP Calcs	0.04	8,096	0.2					
CRU Mother Liquor Drum	DD-414		VOC		BP Calcs	0.04	8,096	0.2					
CRU Evaporation Drum	DE-416		VOC		BP Calcs	1.00	8,096	4.0					
Process Fugitives			VOC		USEPA LDAR EF	20.05	8,096	81.2					

Table B-3  
#2 OX PSD Analysis

2011 Actuals

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM FIRE RATE	POLLUTANT EMITTED	NATURE GAS					DIESEL FUEL (SULFUR = 0.05%)				
				AP-42 1.4 FACTOR (lb/MM scf)	NATURAL GAS EF (lb/MMBtu)	HOURLY EMISSION (lb/hr)	ACTUAL OPERATE (hpy)	ANNUAL EMISSION (tpy)	AP-42 FACTOR (lb/hp-hr)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	ACTUAL OPERATE (hpy)	ANNUAL EMISSION (tpy) - OIL
Emergency Generator #3	DM-135	1072.8	NOx						0.024	AP-42 3.4 (10/96)	25.75	70	0.90
			VOC						0.000642	AP-42 3.4 (10/96)	0.69	70	0.02
			CO						0.0055	AP-42 3.4 (10/96)	5.90	70	0.21
		hp	SO <sub>2</sub>						0.00040	AP-42 3.4 (10/96)	0.43	70	0.02
			PM						0.0007	AP-42 3.4 (10/96)	0.75	70	0.03
			PM <sub>10</sub>						0.0007	AP-42 3.4 (10/96)	0.75	70	0.03
			PM <sub>2.5</sub>						0.0007	AP-42 3.4 (10/96)	0.75	70	0.03
			CO <sub>2</sub> e						163.6	lb/MMBtu-USEPA	440.76	70	15.43
HPVGTS Heater	DB-1813	5.57	NOx	100	0.098	0.55	8,374	2.3					
			VOC	5.5	0.005	0.03	8,374	0.1					
			CO	84	0.082	0.46	8,374	1.9					
		MMBtu/hr	SO <sub>2</sub>	0.6	0.001	0.00	8,374	0.01					
			PM	7.6	0.007	0.04	8,374	0.2					
			PM <sub>10</sub>	7.6	0.007	0.04	8,374	0.2					
			PM <sub>2.5</sub>	7.6	0.007	0.04	8,374	0.2					
			CO <sub>2</sub> e	----	117.000	651.20	8,374	2726.6					
EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (lb/hr)	POLLUTANT EMITTED	POLLUTANT EF (% Removal)	EMISSION FACTOR REFERENCE	HOURLY EMISSION (lb/hr)	ACTUAL OPERATE (hpy)	ANNUAL EMISSION (tpy)	COMMENTS				
HPVGTS	DR-1814/ DT-1821		VOC		Emission Inventory	0.29	8,392	1.2					
			CO			15.67	8,392	65.7					
			CO <sub>2</sub> e		BP calcs/EPA EF	9036.94	8,392	37,919.0					
Low Pressure Absorber	DT-302		VOC		Emission Inventory	4.45	8,392	18.7					
			CO			0.02	8,392	0.1					
			CO <sub>2</sub> e		BP calcs/EPA EF	5.92	8,392	24.8					
Intermediate Silo Scrubber	DT-500	10	PM	99	BP Calcs	0.10	8,392	0.4	Maximum rate based on hourly emissions and % removal				
			PM <sub>10</sub>	99	BP Calcs	0.10	8,392	0.4					
			PM <sub>2.5</sub>	99	BP Calcs	0.10	8,392	0.4					
CRU Extraction Drum	DD-412		VOC		BP Calcs	0.00	8,392	0.02					
CRU Waste Slurry Drum	DD-413		VOC		BP Calcs	0.04	8,392	0.2					
CRU Mother Liquor Drum	DD-414		VOC		BP Calcs	0.04	8,392	0.2					
CRU Evaporation Drum	DE-416		VOC		BP Calcs	1.00	8,392	4.2					
Process Fugitives			VOC		USEPA LDAR EF	20.05	8,392	84.1					



Table B-3  
#2 OX PSD Analysis

ANNUAL EMISSIONS - PTE				
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	FUGITIVE SOURCES (tpy)	TOTALS
NOx	0	12.9	N/A	12.9
VOC	54.1	0.5	95.7	150.3
CO	344.2	6.9	N/A	351.1
SO <sub>2</sub>	0	0.1	N/A	0.1
PM	0.5	0.7	N/A	1.1
PM <sub>10</sub>	0.5	0.7	N/A	1.1
PM <sub>2.5</sub>	0.5	0.7	N/A	1.1
CO <sub>2</sub> e	11,088.8	7797.2	N/A	18,886.0

ANNUAL EMISSIONS - BASELINE ACTUAL				
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	FUGITIVE SOURCES (tpy)	TOTALS
NOx	0	2.9	N/A	2.9
VOC	29.1	0.1	82.7	111.9
CO	69.7	1.9	N/A	71.6
SO <sub>2</sub>	0	0.03	N/A	0.03
PM	0.4	0.2	N/A	0.6
PM <sub>10</sub>	0.4	0.2	N/A	0.6
PM <sub>2.5</sub>	0.4	0.2	N/A	0.6
CO <sub>2</sub> e	28512.7	2474.0	N/A	30986.7

POLLUTANT	THRESHOLD	DELTA (PTE - ACTUAL)
NOx	40	10.0
VOC	40	38.4
CO	100	279.5
SO <sub>2</sub>	40	0.1
PM	25	0.5
PM <sub>10</sub>	15	0.5
PM <sub>2.5</sub>	10	0.5
CO <sub>2</sub> e	75,000	-12100.6

Table B-4  
CR #1 PTA PSD Analysis

PTE

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (cfm)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR (gr/cfm)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Feed Slurry Drum Scrubber	CH-108	-	PM	-	Average of data from 2/95 source test	0.10	8,760	0.4	
			PM <sub>10</sub>	-		0.10	8,760	0.4	
			PM <sub>2.5</sub>	-		0.10	8,760	0.4	
Crystallizer Vent Scrubber	CM-301	-	VOC	-	2/95 Source test	10.62	8,760	46.5	
			PM	-	Average of data from 12/14/04 source test	1.21	8,760	5.3	
			PM <sub>10</sub>	-		1.21	8,760	5.3	
			PM <sub>2.5</sub>	-		1.21	8,760	5.3	
Dryer Scrubber	CM-404A	-	PM	-	Average of data from 2/95 source test	0.30	8,760	1.3	
			PM <sub>10</sub>	-		0.30	8,760	1.3	
			PM <sub>2.5</sub>	-		0.30	8,760	1.3	
Dryer Scrubber	CM-404B		PM	-	Average of data from 2/95 source test	0.30	8,760	1.3	
			PM <sub>10</sub>	-		0.30	8,760	1.3	
			PM <sub>2.5</sub>	-		0.30	8,760	1.3	
Day Silo Baghouse	CM-603A	4,950	PM	0.01	USEPA Handbook	0.42	8,760	1.9	
			PM <sub>10</sub>	0.01	USEPA Handbook	0.42	8,760	1.9	
			PM <sub>2.5</sub>	0.01	USEPA Handbook	0.42	8,760	1.9	
Day Silo Baghouse	CM-603B	4,950	PM	0.01	USEPA Handbook	0.42	8,760	1.9	
			PM <sub>10</sub>	0.01	USEPA Handbook	0.42	8,760	1.9	
			PM <sub>2.5</sub>	0.01	USEPA Handbook	0.42	8,760	1.9	
Rotary Lock A Dust Collector	CM-608A	100	PM	0.01	USEPA Handbook	0.01	8,760	0.04	
			PM <sub>10</sub>	0.01	USEPA Handbook	0.01	8,760	0.04	
			PM <sub>2.5</sub>	0.01	USEPA Handbook	0.01	8,760	0.04	
Rotary Lock B Dust Collector	CM-608B	100	PM	0.01	USEPA Handbook	0.01	8,760	0.04	
			PM <sub>10</sub>	0.01	USEPA Handbook	0.01	8,760	0.04	
			PM <sub>2.5</sub>	0.01	USEPA Handbook	0.01	8,760	0.04	

Table B-4  
CR #1 PTA PSD Analysis

2010 Actuals

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (cfm)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR (gr/cfm)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	ACTUAL OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Feed Slurry Drum Scrubber	CH-108	-	PM	-	Average of data from 2/95 source test	0.10	8,135	0.4	
			PM <sub>10</sub>	-		0.10	8,135	0.4	
			PM <sub>2.5</sub>	-		0.10	8,135	0.4	
Crystallizer Vent Scrubber	CM-301	-	VOC	-	2/95 Source test	10.62	8,135	43.2	
			PM	-	Average of data from 12/14/04 source test	1.80	8,135	7.3	
			PM <sub>10</sub>	-		1.80	8,135	7.3	
			PM <sub>2.5</sub>	-		1.80	8,135	7.3	
Dryer Scrubber	CM-404A	-	PM	-	Average of data from 2/95 source test	0.30	8,135	1.2	
			PM <sub>10</sub>	-		0.30	8,135	1.2	
			PM <sub>2.5</sub>	-		0.30	8,135	1.2	
Dryer Scrubber	CM-404B		PM	-	Average of data from 2/95 source test	0.30	8,135	1.2	
			PM <sub>10</sub>	-		0.30	8,135	1.2	
			PM <sub>2.5</sub>	-		0.30	8,135	1.2	
Day Silo Baghouse	CM-603A	4,950	PM	0.01	USEPA Handbook	0.42	8,135	1.7	
			PM <sub>10</sub>	0.01	USEPA Handbook	0.42	8,135	1.7	
			PM <sub>2.5</sub>	0.01	USEPA Handbook	0.42	8,135	1.7	
Day Silo Baghouse	CM-603B	4,950	PM	0.01	USEPA Handbook	0.42	8,135	1.7	
			PM <sub>10</sub>	0.01	USEPA Handbook	0.42	8,135	1.7	
			PM <sub>2.5</sub>	0.01	USEPA Handbook	0.42	8,135	1.7	
Rotary Lock A Dust Collector	CM-608A	100	PM	0.01	USEPA Handbook	0.01	8,135	0.03	
			PM <sub>10</sub>	0.01	USEPA Handbook	0.01	8,135	0.03	
			PM <sub>2.5</sub>	0.01	USEPA Handbook	0.01	8,135	0.03	
Rotary Lock B Dust Collector	CM-608B	100	PM	0.01	USEPA Handbook	0.01	8,135	0.03	
			PM <sub>10</sub>	0.01	USEPA Handbook	0.01	8,135	0.03	
			PM <sub>2.5</sub>	0.01	USEPA Handbook	0.01	8,135	0.03	

Table B-4  
CR #1 PTA PSD Analysis

2011 Actuals

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (cfm)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR (gr/cfm)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	ACTUAL OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Feed Slurry Drum Scrubber	CH-108	-	PM	-	Average of data from 2/95 source test	0.10	7,194	0.4	
			PM <sub>10</sub>	-		0.10	7,194	0.4	
			PM <sub>2.5</sub>	-		0.10	7,194	0.4	
Crystallizer Vent Scrubber	CM-301	-	VOC	-	2/95 Source test	10.27	7,194	37.0	
			PM	-	Average of data from 12/14/04 source test	1.80	7,194	6.5	
			PM <sub>10</sub>	-		1.80	7,194	6.5	
			PM <sub>2.5</sub>	-		1.80	7,194	6.5	
Dryer Scrubber	CM-404A	-	PM	-	Average of data from 2/95 source test	0.30	7,194	1.1	
			PM <sub>10</sub>	-		0.30	7,194	1.1	
			PM <sub>2.5</sub>	-		0.30	7,194	1.1	
Dryer Scrubber	CM-404B		PM	-	Average of data from 2/95 source test	0.30	7,194	1.1	
			PM <sub>10</sub>	-		0.30	7,194	1.1	
			PM <sub>2.5</sub>	-		0.30	7,194	1.1	
Day Silo Baghouse	CM-603A	4,950	PM	0.01	USEPA Handbook	0.42	7,194	1.5	
			PM <sub>10</sub>	0.01	USEPA Handbook	0.42	7,194	1.5	
			PM <sub>2.5</sub>	0.01	USEPA Handbook	0.42	7,194	1.5	
Day Silo Baghouse	CM-603B	4,950	PM	0.01	USEPA Handbook	0.42	7,194	1.5	
			PM <sub>10</sub>	0.01	USEPA Handbook	0.42	7,194	1.5	
			PM <sub>2.5</sub>	0.01	USEPA Handbook	0.42	7,194	1.5	
Rotary Lock A Dust Collector	CM-608A	100	PM	0.01	USEPA Handbook	0.01	7,194	0.03	
			PM <sub>10</sub>	0.01	USEPA Handbook	0.01	7,194	0.03	
			PM <sub>2.5</sub>	0.01	USEPA Handbook	0.01	7,194	0.03	
Rotary Lock B Dust Collector	CM-608B	100	PM	0.01	USEPA Handbook	0.01	7,194	0.03	
			PM <sub>10</sub>	0.01	USEPA Handbook	0.01	7,194	0.03	
			PM <sub>2.5</sub>	0.01	USEPA Handbook	0.01	7,194	0.03	

Table B-4  
CR #1 PTA PSD Analysis

ANNUAL EMISSIONS - PTE			
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	TOTALS
NOx	0	NA	0
VOC	46.5	NA	46.5
CO	0	NA	0
SO <sub>2</sub>	0	NA	0
PM	12.1	NA	12.14
PM <sub>10</sub>	12.1	NA	12.14
PM <sub>2.5</sub>	12.1	NA	12.14

ANNUAL EMISSIONS - BASELINE ACTUAL			
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	TOTALS
NOx	0	NA	0
VOC	40.1	NA	40.1
CO	0	NA	0
SO <sub>2</sub>	0	NA	0
PM <sub>9</sub>	12.9	NA	12.9
PM <sub>10</sub>	12.9	NA	12.9
PM <sub>2.5</sub>	12.9	NA	12.9

POLLUTANT	THRESHOLD	DELTA (PTE - ACTUAL)
NOx	40	0
VOC	40	6.4
CO	100	0
SO <sub>2</sub>	40	0
PM	25	-0.8
PM <sub>10</sub>	15	-0.8
PM <sub>2.5</sub>	10	-0.8

Table B-5  
CR #2 PTA PSD Analysis

PTE

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (lb/hr)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR (% Removal)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Feed Slurry Drum Scrubber	DH-518	4	PM	99	BP Calcs based on 2/95 test of CD101	0.04	8,760	0.2	Maximum rate based on hourly emissions and % removal
			PM <sub>10</sub>	99		0.04	8,760	0.2	
			PM <sub>2.5</sub>	99		0.04	8,760	0.2	
Crystallizer Vent Scrubber	DM-601	54	PM	99	BP Calcs & source test of 4/98 & 12/04	0.54	8,760	2.4	Maximum PM rates based on hourly emissions and % removal
			PM <sub>10</sub>	99		0.54	8,760	2.4	
			PM <sub>2.5</sub>	99		0.54	8,760	2.4	
		10.6	VOC	0	Source Test	10.62	8,760	46.5	
Dryer Scrubber	DM-704	5.2	PM	95	BP design calcs based on #1 PTA Scrubber	0.26	8,760	1.1	Maximum rate based on hourly emissions and % removal
			PM <sub>10</sub>	95		0.26	8,760	1.1	
			PM <sub>2.5</sub>	95		0.26	8,760	1.1	
Day Silo Dust Collector	DM-797A	265	PM	99.9	BP design calcs based on #1 PTA Silo	0.27	8,760	1.2	Maximum rate based on hourly emissions and % removal
			PM <sub>10</sub>	99.9		0.27	8,760	1.2	
			PM <sub>2.5</sub>	99.9		0.27	8,760	1.2	
Day Silo Dust Collector	DM-797B	265	PM	99.9	BP design calcs based on #1 PTA Silo	0.27	8,760	1.2	Maximum rate based on hourly emissions and % removal
			PM <sub>10</sub>	99.9		0.27	8,760	1.2	
			PM <sub>2.5</sub>	99.9		0.27	8,760	1.2	
Product Recovery Unit	MLSR-2		PM		BP Calcs	0.001	8,760	0.004	
			PM <sub>10</sub>		BP Calcs	0.001	8,760	0.004	
			PM <sub>2.5</sub>		BP Calcs	0.001	8,760	0.004	

Table B-5  
CR #2 PTA PSD Analysis

2010 Actuals

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (lb/hr)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR (% Removal)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Feed Slurry Drum Scrubber	DH-518	4	PM	99	BP Calcs based on 2/95 test of CD101	0.04	8,760	0.2	Maximum rate based on hourly emissions and % removal
			PM <sub>10</sub>	99		0.04	8,760	0.2	
			PM <sub>2.5</sub>	99		0.04	8,760	0.2	
Crystallizer Vent Scrubber	DM-601	54	PM	99	BP Calcs & source test of 4/98 & 12/04	0.54	8,760	2.4	Maximum PM rates based on hourly emissions and % removal
			PM <sub>10</sub>	99		0.54	8,760	2.4	
			PM <sub>2.5</sub>	99		0.54	8,760	2.4	
		10.6	VOC	0	Source Test	10.62	8,760	46.5	
Dryer Scrubber	DM-704	5.2	PM	95	BP design calcs based on #1 PTA Scrubber	0.26	8,760	1.1	Maximum rate based on hourly emissions and % removal
			PM <sub>10</sub>	95		0.26	8,760	1.1	
			PM <sub>2.5</sub>	95		0.26	8,760	1.1	
Day Silo Dust Collector	DM-797A	265	PM	99.9	BP design calcs based on #1 PTA Silo	0.27	8,760	1.2	Maximum rate based on hourly emissions and % removal
			PM <sub>10</sub>	99.9		0.27	8,760	1.2	
			PM <sub>2.5</sub>	99.9		0.27	8,760	1.2	
Day Silo Dust Collector	DM-797B	265	PM	99.9	BP design calcs based on #1 PTA Silo	0.27	8,760	1.2	Maximum rate based on hourly emissions and % removal
			PM <sub>10</sub>	99.9		0.27	8,760	1.2	
			PM <sub>2.5</sub>	99.9		0.27	8,760	1.2	
Product Recovery Unit	MLSR-2		PM		BP Calcs	0.001	8,760	0.004	
			PM <sub>10</sub>		BP Calcs	0.001	8,760	0.004	
			PM <sub>2.5</sub>		BP Calcs	0.001	8,760	0.004	

Table B-5  
CR #2 PTA PSD Analysis

2011 Actuals

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (lb/hr)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR (% Removal)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Feed Slurry Drum Scrubber	DH-518	4	PM	99	BP Calcs based on 2/95 test of CD101	0.04	7,043	0.1	Maximum rate based on hourly emissions and % removal
			PM <sub>10</sub>	99		0.04	7,043	0.1	
			PM <sub>2.5</sub>	99		0.04	7,043	0.1	
Crystallizer Vent Scrubber	DM-601	54	PM	99	BP Calcs & source test of 4/98 & 12/04	0.54	7,043	1.9	Maximum PM rates based on hourly emissions and % removal
			PM <sub>10</sub>	99		0.54	7,043	1.9	
			PM <sub>2.5</sub>	99		0.54	7,043	1.9	
		10.6	VOC	0	Source Test	10.62	7,043	37.4	
Dryer Scrubber	DM-704	5.2	PM	95	BP design calcs based on #1 PTA Scrubber	0.26	7,043	0.9	Maximum rate based on hourly emissions and % removal
			PM <sub>10</sub>	95		0.26	7,043	0.9	
			PM <sub>2.5</sub>	95		0.26	7,043	0.9	
Day Silo Dust Collector	DM-797A	265	PM	99.9	BP design calcs based on #1 PTA Silo	0.27	7,043	0.9	Maximum rate based on hourly emissions and % removal
			PM <sub>10</sub>	99.9		0.27	7,043	0.9	
			PM <sub>2.5</sub>	99.9		0.27	7,043	0.9	
Day Silo Dust Collector	DM-797B	265	PM	99.9	BP design calcs based on #1 PTA Silo	0.27	7,043	0.9	Maximum rate based on hourly emissions and % removal
			PM <sub>10</sub>	99.9		0.27	7,043	0.9	
			PM <sub>2.5</sub>	99.9		0.27	7,043	0.9	
Product Recovery Unit	MLSR-2		PM		BP Calcs	0.001	7,043	0.004	
			PM <sub>10</sub>		BP Calcs	0.001	7,043	0.004	
			PM <sub>2.5</sub>		BP Calcs	0.001	7,043	0.004	



Table B-5  
CR #2 PTA PSD Analysis

ANNUAL EMISSIONS - PTE			
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	TOTALS
NOx	0	NA	0
VOC	46.5	NA	46.5
CO	0	NA	0
SO <sub>2</sub>	0	NA	0
PM	6.0	NA	6.0
PM <sub>10</sub>	6.0	NA	6.0
PM <sub>2.5</sub>	6.0	NA	6.0

ANNUAL EMISSIONS - BASELINE ACTUAL			
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	TOTALS
NOx	0	NA	0
VOC	42.0	NA	42.0
CO	0	NA	0
SO <sub>2</sub>	0	NA	0
PM	5.4	NA	5.4
PM <sub>10</sub>	5.4	NA	5.4
PM <sub>2.5</sub>	5.4	NA	5.4

POLLUTANT	THRESHOLD	DELTA (PTE - ACTUAL)
NOx	40	0
VOC	40	4.6
CO	100	0
SO <sub>2</sub>	40	0
PM	25	0.6
PM <sub>10</sub>	15	0.6
PM <sub>2.5</sub>	10	0.6

Table B-6  
Cooling Towers PSD Analysis

PTE

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (gpm)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR (% Removal)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Cooling Tower	AT-201	97000	PM	97	Table B-30	0.44	8,760	1.9	Reisman, Frisbie, 2002
			PM <sub>10</sub>	97	Table B-30	0.32	8,760	1.4	Reisman, Frisbie, 2002
			PM <sub>2.5</sub>	97	Table B-30	0.001	8,760	0.004	Reisman, Frisbie, 2002
Cooling Tower	AT-202	97000	PM	97	Table B-30	0.44	8,760	1.9	Reisman, Frisbie, 2002
			PM <sub>10</sub>	97	Table B-30	0.32	8,760	1.4	Reisman, Frisbie, 2002
			PM <sub>2.5</sub>	97	Table B-30	0.001	8,760	0.004	Reisman, Frisbie, 2002

2010 Actuals

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (gpm)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR (% Removal)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Cooling Tower	AT-201	68000	PM	97	Table B-30	0.31	8,760	1.3	Reisman, Frisbie, 2002
			PM <sub>10</sub>	97	Table B-30	0.22	8,760	1.0	Reisman, Frisbie, 2002
			PM <sub>2.5</sub>	97	Table B-30	0.001	8,760	0.003	Reisman, Frisbie, 2002
Cooling Tower	AT-202	68000	PM	97	Table B-30	0.31	8,760	1.3	Reisman, Frisbie, 2002
			PM <sub>10</sub>	97	Table B-30	0.22	8,760	1.0	Reisman, Frisbie, 2002
			PM <sub>2.5</sub>	97	Table B-30	0.001	8,760	0.003	Reisman, Frisbie, 2002

2011 Actuals

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (gpm)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR (% Removal)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Cooling Tower	AT-201	68000	PM	97	Table B-30	0.31	8,760	1.3	Reisman, Frisbie, 2002
			PM <sub>10</sub>	97	Table B-30	0.22	8,760	1.0	Reisman, Frisbie, 2002
			PM <sub>2.5</sub>	97	Table B-30	0.001	8,760	0.003	Reisman, Frisbie, 2002
Cooling Tower	AT-202	68000	PM	97	Table B-30	0.31	8,760	1.3	Reisman, Frisbie, 2002
			PM <sub>10</sub>	97	Table B-30	0.22	8,760	1.0	Reisman, Frisbie, 2002
			PM <sub>2.5</sub>	97	Table B-30	0.001	8,760	0.003	Reisman, Frisbie, 2002

ANNUAL EMISSIONS - PTE			
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	TOTALS
NOx	0	NA	0
VOC	0	NA	0
CO	0	NA	0
SO <sub>2</sub>	0	NA	0
PM	3.8	NA	3.8
PM <sub>10</sub>	2.8	NA	2.8
PM <sub>2.5</sub>	0.01	NA	0.01

ANNUAL EMISSIONS - BASELINE ACTUAL			
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	TOTALS
NOx	0	NA	0
VOC	0	NA	0
CO	0	NA	0
SO <sub>2</sub>	0	NA	0
PM	2.7	NA	2.7
PM <sub>10</sub>	1.9	NA	1.9
PM <sub>2.5</sub>	0.01	NA	0.01

POLLUTANT	THRESHOLD	DELTA (PTE - ACTUAL)
NOx	40	0
VOC	40	0
CO	100	0
SO <sub>2</sub>	40	0
PM	25	1.1
PM <sub>10</sub>	15	0.8
PM <sub>2.5</sub>	10	0.003

Table B-7  
Fugitive Emissions

**Post-Project (After BACT)**

	VALVES, LIQUID	VALVES, GAS	FLANGES DRAINS, VENTS & OTHERS	PUMPS	RELIEF VALVES	AGITATORS	COMPRESSORS	TOTAL HAPS EMISSIONS (lb/yr)	TOTAL STREAM (lb/yr)	TOTAL STREAM (tpy)
EF, lb/hr/item: (NSPS)	0.00347	0.00434	0.00270	0.01360	0.08942	0.01360	0.01360			
EF, lb/hr/item: (HON)	0.00107	0.00105	0.00028	0.01097	0.02751	0.01097	0.01097			
#1 OX Unit (HON)	218	0	398	4	3	1	0	1266.82	4223	2.11
#1 OX (NSPS as HON)	2023	85	4215	34	17	18	5	494.73	39676	19.84
#2 OX (HON)	244	0	534	3	4	1	0	1485.18	4949	2.47
#2 OX (NSPS as HON)	1960	202	4325	37	13	15	4	491.14	39388	19.69
OSBL (HON)	303	1	588	6	4	0	0	5834.33	5834	2.92
<b>Total</b>	<b>4748.10</b>	<b>288.11</b>	<b>10060.10</b>	<b>84.02</b>	<b>41.12</b>	<b>35.02</b>	<b>9.02</b>	<b>9,572</b>	<b>94,070</b>	<b>47.04</b>

Project LDAR Impact 10.00%

Factors	USEPA Factor		EF		Effectiveness Factor	
	kg/hr	lb/kg	lb/hr		HON	NSPS
Valves, Liquid	0.00403	2.204623	0.00888		0.88	0.61
Valves, Gas	0.00597	2.204623	0.01316		0.92	0.67
Flanges , Drains, Vents, Other	0.00183	2.204623	0.00403		0.93	0.33
Pumps	0.01990	2.204623	0.04387		0.75	0.69
Relief Valves	0.10400	2.204623	0.22928		0.88	0.61
Agitators	0.01990	2.204623	0.04387		0.75	0.69
Compressors	0.01990	2.204623	0.04387		0.75	0.69
Sample Connection	0.01500	2.204623	0.03307		0.93	0.33

USEPA Factor is based on table 2-1 from USEPA Report of 1995 on LDAR Emission factors - Average Emission Factors

Effectiveness factors - HON are based on Table 5-9 from 1995 USEPA Report, NSPS from EIIP Volume II, Table 4.2.2

**Pre-Project**

	VALVES, LIQUID	VALVES, GAS	FLANGES DRAINS, VENTS & OTHERS	PUMPS	RELIEF VALVES	AGITATORS	COMPRESSORS	TOTAL HAPS EMISSIONS (lb/yr)	TOTAL STREAM (lb/yr)	TOTAL STREAM (tpy)
EF, lb/hr/item: (NSPS)	0.00347	0.00434	0.00270	0.01360	0.08942	0.01360	0.01360			
EF, lb/hr/item: (HON)	0.00107	0.00105	0.00028	0.01097	0.02751	0.01097	0.01097			
#1 OX Unit (HON)	198	0	362	4	3	1	0	1184.47	3948	1.97
#1 OX (NSPS)	1839	77	3832	34	17	18	5	2114.70	169595	84.80
#2 OX (HON)	222	0	485	3	4	1	0	1386.95	4622	2.31
#2 OX (NSPS)	1782	184	3932	37	13	15	4	2132.86	171052	85.53
OSBL (HON)	303	1	588	6	4	0	0	5834.33	5834	2.92
<b>Total</b>	<b>4344.00</b>	<b>262.01</b>	<b>9199.00</b>	<b>84.02</b>	<b>41.12</b>	<b>35.02</b>	<b>9.02</b>	<b>12,653</b>	<b>355,051</b>	<b>177.53</b>

**Table B-8**  
**Tank Farm (Unmodified/Debottlenecked)**

**PTE**

EQUIPMENT DESCRIPTION	EQUIPMENT ID NO.	STACK ID NO.	QUANTITY (gallons)	STANDING LOSS (lb/yr)	WORKING LOSS (lb/yr)	TOTAL LOSS (lb/yr)	ANNUAL TOTAL (tpy)
Paraxylene Tank	AF- 101	TK-1	108,974,400	694.89	172.20	867.09	0.43
	AF- 102	TK-2	108,974,400	694.89	172.20	867.09	0.43
	AF- 103	TK-3	108,974,400	694.89	172.20	867.09	0.43
<b>TOTALS</b>			326,923,200	2,084.67	516.60	2,601.27	1.30

**2010 Actuals**

EQUIPMENT DESCRIPTION	EQUIPMENT ID NO.	STACK ID NO.	QUANTITY (gallons)	STANDING LOSS (lb/yr)	WORKING LOSS (lb/yr)	TOTAL LOSS (lb/yr)	ANNUAL TOTAL (tpy)
Paraxylene Tank	AF- 101	TK-1	78,733,394	694.89	124.41	819.30	0.41
	AF- 102	TK-2	78,733,394	694.89	124.41	819.30	0.41
	AF- 103	TK-3	78,733,394	694.89	124.41	819.30	0.41
<b>TOTALS</b>			236,200,182	2,084.67	373.23	2,457.90	1.23

**2011 Actuals**

EQUIPMENT DESCRIPTION	EQUIPMENT ID NO.	STACK ID NO.	QUANTITY (gallons)	STANDING LOSS (lb/yr)	WORKING LOSS (lb/yr)	TOTAL LOSS (lb/yr)	ANNUAL TOTAL (tpy)
Paraxylene Tank	AF- 101	TK-1	73,912,058	694.89	116.79	811.68	0.41
	AF- 102	TK-2	73,912,058	694.89	116.79	811.68	0.41
	AF- 103	TK-3	73,912,058	694.89	116.79	811.68	0.41
<b>TOTALS</b>			221,736,174	2,084.67	350.37	2,435.04	1.22

	<b>PTE</b>	<b>Actuals</b>	<b>Delta</b>
VOC	1.30	1.22	0.08

Table B-9  
CR Shipping (Unmodified/Debottlenecked)

PTE

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	STACK ID NUMBER	MAXIMUM RATE (cfm)	POLLUTANT(S) EMITTED	POLLUTANT EMISSION FACTOR (gr/cfm)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	PTE EMISSIONS (tpy)	COMMENTS
Storage Silo A Baghouse	CM-701A	SL-1	4,950	PM	0.01	USEPA Book	0.42	8,760	1.86	EPA/625/6-91/014: Control Technologies for HAPs
				PM <sub>10</sub>	0.01	USEPA Book	0.42	8,760	1.86	
				PM <sub>2.5</sub>	0.01	USEPA Book	0.42	8,760	1.86	
Storage Silo B Baghouse	CM-701B	SL-2	4,950	PM	0.01	USEPA Book	0.42	8,760	1.86	
				PM <sub>10</sub>	0.01	USEPA Book	0.42	8,760	1.86	
				PM <sub>2.5</sub>	0.01	USEPA Book	0.42	8,760	1.86	
Storage Silo C Baghouse	CM-701C	SL-3	4,950	PM	0.01	USEPA Book	0.42	8,760	1.86	
				PM <sub>10</sub>	0.01	USEPA Book	0.42	8,760	1.86	
				PM <sub>2.5</sub>	0.01	USEPA Book	0.42	8,760	1.86	
Storage Silo D Baghouse	CM-701D	SL-4	4,950	PM	0.01	USEPA Book	0.42	8,760	1.86	
				PM <sub>10</sub>	0.01	USEPA Book	0.42	8,760	1.86	
				PM <sub>2.5</sub>	0.01	USEPA Book	0.42	8,760	1.86	
Storage Silo E Baghouse	CM-701E	SL-5	4,950	PM	0.01	USEPA Book	0.42	8,760	1.86	
				PM <sub>10</sub>	0.01	USEPA Book	0.42	8,760	1.86	
				PM <sub>2.5</sub>	0.01	USEPA Book	0.42	8,760	1.86	
Storage Silo F Baghouse	CM-720 A/B	SL-6A/B		PM	-	Average of 06/11/02 source test	0.48	8,760	2.10	EPA/625/6-91/014: Control Technologies for HAPs
				PM <sub>10</sub>	-		0.48	8,760	2.10	
				PM <sub>2.5</sub>	-		0.48	8,760	2.10	
Loading Spout A Dust Collector	CP-705A	SL-7	1,200	PM	0.01	USEPA Book	0.10	8,760	0.45	
				PM <sub>10</sub>	0.01	USEPA Book	0.10	8,760	0.45	
				PM <sub>2.5</sub>	0.01	USEPA Book	0.10	8,760	0.45	
Loading Spout B Dust Collector	CP-705B	SL-8	1,200	PM	0.01	USEPA Book	0.10	8,760	0.45	
				PM <sub>10</sub>	0.01	USEPA Book	0.10	8,760	0.45	
				PM <sub>2.5</sub>	0.01	USEPA Book	0.10	8,760	0.45	
Loading Spout C Dust Collector	CP-705C	SL-9	1,200	PM	0.01	USEPA Book	0.10	8,760	0.45	
				PM <sub>10</sub>	0.01	USEPA Book	0.10	8,760	0.45	
				PM <sub>2.5</sub>	0.01	USEPA Book	0.10	8,760	0.45	
Bulk Truck Loading Bag Filter	CM-722	SL-10		PM	-	BP Calcs	0.20	8,760	0.88	
				PM <sub>10</sub>	-	BP Calcs	0.20	8,760	0.88	
				PM <sub>2.5</sub>	-	BP Calcs	0.20	8,760	0.88	

Table B-9  
CR Shipping (Unmodified/Debottlenecked)

2010 Actuals

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	STACK ID NUMBER	MAXIMUM RATE (cfm)	POLLUTANT(S) EMITTED	POLLUTANT EMISSION FACTOR (gr/cfm)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	PTE EMISSIONS (tpy)	COMMENTS
Storage Silo A Baghouse	CM-701A	SL-1	4,950	PM	0.01	USEPA Book	0.42	8,760	1.86	EPA/625/6-91/014: Control Technologies for HAPs
				PM <sub>10</sub>	0.01	USEPA Book	0.42	8,760	1.86	
				PM <sub>2.5</sub>	0.01	USEPA Book	0.42	8,760	1.86	
Storage Silo B Baghouse	CM-701B	SL-2	4,950	PM	0.01	USEPA Book	0.42	8,760	1.86	
				PM <sub>10</sub>	0.01	USEPA Book	0.42	8,760	1.86	
				PM <sub>2.5</sub>	0.01	USEPA Book	0.42	8,760	1.86	
Storage Silo C Baghouse	CM-701C	SL-3	4,950	PM	0.01	USEPA Book	0.42	8,760	1.86	
				PM <sub>10</sub>	0.01	USEPA Book	0.42	8,760	1.86	
				PM <sub>2.5</sub>	0.01	USEPA Book	0.42	8,760	1.86	
Storage Silo D Baghouse	CM-701D	SL-4	4,950	PM	0.01	USEPA Book	0.42	8,760	1.86	
				PM <sub>10</sub>	0.01	USEPA Book	0.42	8,760	1.86	
				PM <sub>2.5</sub>	0.01	USEPA Book	0.42	8,760	1.86	
Storage Silo E Baghouse	CM-701E	SL-5	4,950	PM	0.01	USEPA Book	0.42	8,760	1.86	
				PM <sub>10</sub>	0.01	USEPA Book	0.42	8,760	1.86	
				PM <sub>2.5</sub>	0.01	USEPA Book	0.42	8,760	1.86	
Storage Silo F Baghouse	CM-720 A/B	SL-6A/B		PM	-	Based on 06/11/02 source test	0.48	8,760	2.10	EPA/625/6-91/014: Control Technologies for HAPs
				PM <sub>10</sub>	-		0.48	8,760	2.10	
				PM <sub>2.5</sub>	-		0.48	8,760	2.10	
Loading Spout A Dust Collector	CP-705A	SL-7	1,200	PM	0.01	USEPA Book	0.10	5,200	0.27	
				PM <sub>10</sub>	0.01	USEPA Book	0.10	5,200	0.27	
				PM <sub>2.5</sub>	0.01	USEPA Book	0.10	5,200	0.27	
Loading Spout B Dust Collector	CP-705B	SL-8	1,200	PM	0.01	USEPA Book	0.10	5,200	0.27	
				PM <sub>10</sub>	0.01	USEPA Book	0.10	5,200	0.27	
				PM <sub>2.5</sub>	0.01	USEPA Book	0.10	5,200	0.27	
Loading Spout C Dust Collector	CP-705C	SL-9	1,200	PM	0.01	USEPA Book	0.10	5,200	0.27	
				PM <sub>10</sub>	0.01	USEPA Book	0.10	5,200	0.27	
				PM <sub>2.5</sub>	0.01	USEPA Book	0.10	5,200	0.27	
Bulk Truck Loading Bag Filter	CM-722	SL-10		PM	-	BP Calcs	0.20	5,200	0.52	
				PM <sub>10</sub>	-	BP Calcs	0.20	5,200	0.52	
				PM <sub>2.5</sub>	-	BP Calcs	0.20	5,200	0.52	

Table B-9  
CR Shipping (Unmodified/Debottlenecked)

2011 Actuals

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	STACK ID NUMBER	MAXIMUM RATE (cfm)	POLLUTANT(S) EMITTED	POLLUTANT EMISSION FACTOR (gr/cfm)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	PTE EMISSIONS (tpy)	COMMENTS
Storage Silo A Baghouse	CM-701A	SL-1	4,950	PM	0.01	USEPA Book	0.42	8,760	1.86	EPA/625/6-91/014: Control Technologies for HAPs
				PM <sub>10</sub>	0.01	USEPA Book	0.42	8,760	1.86	
				PM <sub>2.5</sub>	0.01	USEPA Book	0.42	8,760	1.86	
Storage Silo B Baghouse	CM-701B	SL-2	4,950	PM	0.01	USEPA Book	0.42	8,760	1.86	
				PM <sub>10</sub>	0.01	USEPA Book	0.42	8,760	1.86	
				PM <sub>2.5</sub>	0.01	USEPA Book	0.42	8,760	1.86	
Storage Silo C Baghouse	CM-701C	SL-3	4,950	PM	0.01	USEPA Book	0.42	8,760	1.86	
				PM <sub>10</sub>	0.01	USEPA Book	0.42	8,760	1.86	
				PM <sub>2.5</sub>	0.01	USEPA Book	0.42	8,760	1.86	
Storage Silo D Baghouse	CM-701D	SL-4	4,950	PM	0.01	USEPA Book	0.42	8,760	1.86	
				PM <sub>10</sub>	0.01	USEPA Book	0.42	8,760	1.86	
				PM <sub>2.5</sub>	0.01	USEPA Book	0.42	8,760	1.86	
Storage Silo E Baghouse	CM-701E	SL-5	4,950	PM	0.01	USEPA Book	0.42	8,760	1.86	
				PM <sub>10</sub>	0.01	USEPA Book	0.42	8,760	1.86	
				PM <sub>2.5</sub>	0.01	USEPA Book	0.42	8,760	1.86	
Storage Silo F Baghouse	CM-720 A/B	SL-6A/B		PM	-	Based on 06/11/02 source test	0.48	8,760	2.10	EPA/625/6-91/014: Control Technologies for HAPs
				PM <sub>10</sub>	-		0.48	8,760	2.10	
				PM <sub>2.5</sub>	-		0.48	8,760	2.10	
Loading Spout A Dust Collector	CP-705A	SL-7	1,200	PM	0.01	USEPA Book	0.10	3,500	0.18	
				PM <sub>10</sub>	0.01	USEPA Book	0.10	3,500	0.18	
				PM <sub>2.5</sub>	0.01	USEPA Book	0.10	3,500	0.18	
Loading Spout B Dust Collector	CP-705B	SL-8	1,200	PM	0.01	USEPA Book	0.10	3,500	0.18	
				PM <sub>10</sub>	0.01	USEPA Book	0.10	3,500	0.18	
				PM <sub>2.5</sub>	0.01	USEPA Book	0.10	3,500	0.18	
Loading Spout C Dust Collector	CP-705C	SL-9	1,200	PM	0.01	USEPA Book	0.10	3,500	0.18	
				PM <sub>10</sub>	0.01	USEPA Book	0.10	3,500	0.18	
				PM <sub>2.5</sub>	0.01	USEPA Book	0.10	3,500	0.18	
Bulk Truck Loading Bag Filter	CM-722	SL-10		PM	-	BP Calcs	0.20	3,500	0.35	
				PM <sub>10</sub>	-	BP Calcs	0.20	3,500	0.35	
				PM <sub>2.5</sub>	-	BP Calcs	0.20	3,500	0.35	

SHIPPING AND LOADING PTE EMISSIONS		
POLLUTANT	PROCESS SOURCES (tpy)	TOTALS
PM	9.91	9.91
PM <sub>10</sub>	9.91	9.91
PM <sub>2.5</sub>	9.91	9.91

S&L BASELINE ACTUAL EMISSIONS		
POLLUTANT	PROCESS SOURCES (tpy)	TOTALS
PM	8.78	8.78
PM <sub>10</sub>	8.78	8.78
PM <sub>2.5</sub>	8.78	8.78

POLLUTANT	THRESHOLD	DELTA (PTE - ACTUAL)
PM	25	1.12
PM <sub>10</sub>	15	1.12
PM <sub>2.5</sub>	10	1.12

**Table B-10**  
**Incremental Boiler Steam Production**

**Emission Equipment**  
**Equipment ID Number**  
**Stack ID No.**

**Boiler 3 or 4**  
**350 - A or B**  
**U-10 or 11**

MAXIMUM FIRE RATE	NATURAL GAS							COMMENTS
	POLLUTANT EMITTED	AP-42 EF (lb/MMscf)	NG EF (lb/MMBtu)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	OPERATE (hrs/yr)	ANNUAL EMISSION (tpy)	
49.30  MMBtu/hr	NOx	---	0.0800	<b>Vendor Data</b>	3.944	8,760	17.28	*Boiler has firm gas and only burns oil in force majeure.
	VOC	5.5	0.0054	AP-42 1.4 (7/98)	0.266	8,760	1.16	
	CO	84	0.0824	AP-42 1.4 (7/98)	4.060	8,760	17.78	
	SO <sub>2</sub>	0.6	0.0006	AP-42 1.4 (7/98)	0.029	8,760	0.13	
	PM	5.1	0.0050	<b>Vendor Data</b>	0.247	8,760	1.08	
	PM <sub>10</sub>	5.1	0.0050	<b>Vendor Data</b>	0.247	8,760	1.08	
	PM <sub>2.5</sub>	5.1	0.0050	<b>Vendor Data</b>	0.247	8,760	1.08	
	CO <sub>2</sub> e	---	117	USEPA Data	5,768.26	8,760	25,265	

INCREMENTAL STEAM PRODUCTION			
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	TOTALS (tpy)
NOx	N/A	17.28	17.28
VOC	N/A	1.16	1.16
CO	N/A	17.78	17.78
SO <sub>2</sub>	N/A	0.13	0.13
PM	N/A	1.08	1.08
PM <sub>10</sub>	N/A	1.08	1.08
PM <sub>2.5</sub>	N/A	1.08	1.08
CO <sub>2</sub> e	N/A	25,264.98	25,265

<b>Incremental Process Steam Usage</b>	<b>40</b>	M lbs/hr
<b>Incremental Turbine Steam Usage</b>	<b>0.41</b>	
<b>Incremental Fuel Burned</b>	<b>1220.00</b>	Btu/lb of steam
<b>Fuel</b>	<b>49.30</b>	MMBtu/hr

Assume fuel is gas since asked to be gas boiler for MACT



**Table B-11**  
**Post-Project Facility-Wide Controlled Emissions**

**Controlled Emissions - Modified Units (tpy)**

POLLUTANTS	CR #1 OX	CR #2 OX	CR #1 PTA	CR #2 PTA	COOLING TOWER	TOTAL
NOx	0.5	12.9	0	0	0	13.4
VOC	157.0	150.3	46.5	46.5	0	400.3
CO	403.1	351.1	0	0	0	754.2
SO <sub>2</sub>	0.03	0.1	0	0	0	0.2
PM	6.6	1.1	12.1	6.0	3.8	29.7
PM <sub>10</sub>	6.6	1.1	12.1	6.0	2.8	28.7
PM <sub>2.5</sub>	6.6	1.1	12.1	6.0	0.01	25.9
CO <sub>2</sub> e	42,947	18,886	0	0	0	61,833

**Controlled Emissions - Unmodified Units (tpy)**

POLLUTANTS	SHIP & LOAD	UTILITY	WWT	TOTAL
NOx	0	311.2	0	311.2
VOC	0	21.2	69	89.8
CO	0	286.1	0	286.1
SO <sub>2</sub>	0	188.9	0	188.9
PM	13.6	33.8	0	47.4
PM <sub>10</sub>	13.6	30.7	0	44.3
PM <sub>2.5</sub>	13.6	28.4	0	42.0
CO <sub>2</sub> e	0	418,175	0	418,174.8

**Facility-Wide - Post Project (tpy)**

POLLUTANTS	MODIFIED UNITS	UNMODIFIED UNITS	FACILITY-WIDE TOTAL
NOx	13.4	311.2	324.6
VOC	400.3	89.8	490.2
CO	754.2	286.1	1040.3
SO <sub>2</sub>	0.2	188.9	189.1
PM	29.7	47.4	77.1
PM <sub>10</sub>	28.7	44.3	73.0
PM <sub>2.5</sub>	25.9	42.0	67.9
CO <sub>2</sub> e	61,833	418,175	480,008

## Uncontrolled Emissions

Table B-12  
Facility Uncontrolled Pre- and Post-Project PTE EmissionsSummary

**Modified Units Post-Project Uncontrolled Emissions (tpy)**

POLLUTANTS	CR #1 OX	CR #2 OX	CR #1 PTA	CR #2 PTA	COOLING TOWER	TOTAL
NOx	45.5	119.2	0	0	0	164.7
VOC	1,276.3	1,020.5	46.5	46.4	0	2,389.7
CO	7,715.4	6,617.9	0	0	0	14,333.3
SO <sub>2</sub>	3.0	1.9	0	0	0	4.9
PM	9.8	49.2	1,215.8	2598.7	127.6	4,001.0
PM <sub>10</sub>	9.8	49.2	1,215.8	2598.7	92.6	3,966.0
PM <sub>2.5</sub>	9.8	49.2	1,215.8	2598.7	0.3	3,873.7
CO <sub>2</sub> e	43,543	20,706	0	0	0	64,249

**Modified Units Pre-Project Uncontrolled Emissions (tpy)**

POLLUTANTS	CR #1 OX	CR #2 OX	CR #1 PTA	CR #2 PTA	COOLING TOWER	TOTAL
NOx	45.5	119.2	0	0	0	164.7
VOC	1,325.3	1,008.8	30.7	30.7	0.0	2,395.4
CO	10,210.9	6,616.9	0	0	0	16,827.7
SO <sub>2</sub>	3.0	1.9	0	0	0	4.9
PM	9.8	49.2	1,474.2	2,598.7	89.4	4,221.3
PM <sub>10</sub>	9.8	49.2	1,474.2	2,598.7	64.9	4,196.7
PM <sub>2.5</sub>	9.8	49.2	1,474.2	2,598.7	0.2	4,132.0
CO <sub>2</sub> e	49,315	20,706	0	0	0	70,021

**Uncontrolled Facility-Wide Totals -  
Post-Project**

POLLUTANTS	MODIFIED	UNMODIFIED	TOTAL	PRE	UNMODIFIED	TOTAL
NOx	164.7	311.2	475.9	164.7	311.2	475.9
VOC	2,389.7	89.8	2,479.5	2,395.4	89.8	2,485.2
CO	14,333.3	286.1	14,619.4	16,827.7	286.1	17,113.9
SO <sub>2</sub>	4.9	188.9	193.8	4.9	188.9	193.8
PM	4,001.0	1,396.0	5,396.9	4,221.3	1,396.0	5,617.2
PM <sub>10</sub>	3,966.0	1,392.9	5,359.0	4,196.7	1,392.9	5,589.7
PM <sub>2.5</sub>	3,873.7	1,390.7	5,264.4	4,132.0	1,390.7	5,522.7
CO <sub>2</sub> e	64,249	418,175	482,424	70,021.2	418,175	488,196

**Uncontrolled Facility-Wide Totals -  
Pre-Project**

Table B-13  
CR #1 OX Uncontrolled Pre- and Post-Project PTE Emissions

**PTE - Uncontrolled Post-Project**

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (HP)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR	UNITS	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	OPERATING HOURS (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Emergency Generator #2	BM-1201	335	NOx	0.031	lb/hp-hr	AP-42 3.3 (10/96)	10.385	8,760	45.5	Diesel Fuel Sulfur = 0.05%.
			VOC	0.00251	lb/hp-hr	AP-42 3.3 (10/96)	0.842	8,760	3.7	
			CO	0.00668	lb/hp-hr	AP-42 3.3 (10/96)	2.238	8,760	9.8	
			SO <sub>2</sub>	0.00205	lb/hp-hr	AP-42 3.3 (10/96)	0.687	8,760	3.0	
			PM	0.0022	lb/hp-hr	AP-42 3.3 (10/96)	0.737	8,760	3.2	
			PM <sub>10</sub>	0.0022	lb/hp-hr	AP-42 3.3 (10/96)	0.737	8,760	3.2	
			PM <sub>2.5</sub>	0.0022	lb/hp-hr	AP-42 3.3 (10/96)	0.737	8,760	3.2	
			CO <sub>2</sub> e	163.6	lb/MMBtu	USEPA Data	137.634	8,760	602.8	
EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (lbs/hr)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR	UNITS	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	OPERATING HOURS (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
HPVGTS	HPVGTS-1	234	VOC	0.0	% Removal	Based on controlled & efficiency	234.00	8,760	1024.9	Assume 0 Removal for control device
		1755	CO	0.0	% Removal		1755.00	8,760	7687.6	
		9510.6	CO <sub>2</sub> e	0	% Removal		9510.6	8,760	41700.0	
Low Pressure Absorber	BT-603	9.6	VOC			Recovery device so based on controlled emissions	9.6	8,760	42.0	Recovery Device
		4.1	CO				4.1	8,760	18.0	
		283.0	CO <sub>2</sub> e				283.0	8,760	1239.9	
CRU Extraction Drum	BD-625	CRU removed	VOC							CRU is being removed
CRU Surge Drum	BD-631		VOC							
CRU Waste Slurry Drum	BD-632		VOC							
Silo Scrubber	BT-501		PM	0	% Removal	Based on controlled & efficiency	1.50	8,760	6.6	Assume 0 Removal for control device
			PM <sub>10</sub>	0.0	% Removal		1.50	8,760	6.6	
			PM <sub>2.5</sub>	0	% Removal		1.50	8,760	6.6	
CRU Evaporator Overhd Condenser	BE-645	CRU removed	VOC							CRU being removed
DHT Ovhd Scrubber	BT-702	Vent Removed	VOC							Vent Removed
			CO							
			CO <sub>2</sub> e							
Process Fugitives			VOC			USEPA LDAR EF	46.9	8,760	205.6	No LDAR program

Table B-13  
CR #1 OX Uncontrolled Pre- and Post-Project PTE Emissions

PTE - Uncontrolled Pre-Project

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM FIRE RATE (HP)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR	UNITS	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	UNCONTROLLED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Emergency Generator #2	BM-1201	335	NOx	0.031	lb/hp-hr	AP-42 3.3 (10/96)	10.385	8,760	45.5	Diesel Fuel Sulfur = 0.05%.
			VOC	0.00251	lb/hp-hr	AP-42 3.3 (10/96)	0.842	8,760	3.7	
			CO	0.00668	lb/hp-hr	AP-42 3.3 (10/96)	2.238	8,760	9.8	
			SO <sub>2</sub>	0.00205	lb/hp-hr	AP-42 3.3 (10/96)	0.687	8,760	3.0	
			PM	0.0022	lb/hp-hr	AP-42 3.3 (10/96)	0.737	8,760	3.2	
			PM <sub>10</sub>	0.0022	lb/hp-hr	AP-42 3.3 (10/96)	0.737	8,760	3.2	
			PM <sub>2.5</sub>	0.0022	lb/hp-hr	AP-42 3.3 (10/96)	0.737	8,760	3.2	
			CO <sub>2</sub> e	163.6	lb/MMBtu	USEPA Data	137.634	8,760	602.8	
EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (lbs/hr)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR	UNITS	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	OPERATING HOURS (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
HPVGTS	HPVGTS-1	131	VOC	0.0	% Removal	Based on controlled & efficiency	131.00	8,760	573.8	Assume 0 Removal for control device
		2233	CO	0.0	% Removal		2233.00	8,760	9781.2	
		10000.0	CO <sub>2</sub> e	0	% Removal		10000.0	8,760	43843.6	
Low Pressure Absorber	BT-603	20	VOC			Recovery device so based on controlled emissions	20.00	8,760	87.6	Recovery Device
		9.0	CO				9.00	8,760	39.8	
		400.0	CO <sub>2</sub> e				400.0	8,760	1752.4	
CRU Extraction Drum	BD-625		VOC			BP Calcs	1.0	8,760	4.4	CRU is being removed
CRU Surge Drum	BD-631		VOC			BP Calcs	4.0	8,760	17.5	
CRU Waste Slurry Drum	BD-632		VOC			BP Calcs	0.003	8,760	0.01	
Silo Scrubber	BT-501		PM	0	% Removal	Based on controlled & efficiency	1.50	8,760	6.6	Assume 0 Removal for control device
			PM <sub>10</sub>	0.0	% Removal		1.50	8,760	6.6	
			PM <sub>2.5</sub>	0	% Removal		1.50	8,760	6.6	
CRU Evaporator Overhd Condenser	BE-645	CRU removed	VOC				0.3	8,760	1.3	CRU being removed
DHT Ovhd Scrubber	BT-702	Vent Removed	VOC				60.0	8,760	262.8	Vent Removed
			CO				87.0	8,760	380.0	
			CO <sub>2</sub> e				711.4	8,760	3115.9	
Process Fugitives			VOC			USEPA LDAR EF	42.7	8,760	187.1	No LDAR program

TOTAL POST PROJECT EMISSIONS - #1 OX PTE (tpy)				
POLLUTANT	PROCESS SOURCES	COMBUSTION SOURCES	FUGITIVE SOURCES	TOTALS
NOx	0.0	45.5	N/A	45.5
VOC	1067.0	3.7	205.6	1276.3
CO	7705.6	9.8	N/A	7715.4
SO <sub>2</sub>	0.0	3.0	N/A	3.0
PM	6.6	3.2	N/A	9.8
PM <sub>10</sub>	6.6	3.2	N/A	9.8
PM <sub>2.5</sub>	6.6	3.2	N/A	9.8
CO <sub>2</sub> e	42,940.0	602.8	N/A	43,542.8

TOTAL PRE PROJECT EMISSIONS - #1 OX PTE (tpy)				
POLLUTANT	PROCESS SOURCES	COMBUSTION SOURCES	FUGITIVE SOURCES	TOTALS
NOx	0.0	45.5	N/A	45.5
VOC	1134.5	3.7	187.1	1325.3
CO	10201.1	9.8	N/A	10210.9
SO <sub>2</sub>	0.0	3.0	N/A	3.0
PM	6.6	3.2	N/A	9.8
PM <sub>10</sub>	6.6	3.2	N/A	9.8
PM <sub>2.5</sub>	6.6	3.2	N/A	9.8
CO <sub>2</sub> e	48,711.9	602.8	N/A	49,314.8

Table B-14  
#2 OX Uncontrolled Pre- and Post-Project PTE Emissions

PTE - Uncontrolled Post-Project

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM FIRE RATE	NATURAL GAS						DIESEL FUEL (SULFUR = 0.05%)				
			POLLUTANT EMITTED	AP-42 1.4 FACTOR (lb/MM scf)	NATURAL GAS EF (lb/MMBtu)	HOURLY EMISSION (lb/hr)	UNCONTROL OPERATE (hpy)	ANNUAL EMISSION (tpy)	AP-42 FACTOR (lb/hp-hr)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	UNCONTROL OPERATE (hpy)	ANNUAL EMISSION (tpy) - Oil
Emergency Generator #3	DM-135	1072.8	NOx						0.024	AP-42 3.4 (10/96)	25.75	8,760	112.77
			VOC						0.000642	AP-42 3.4 (10/96)	0.69	8,760	3.01
			CO						0.0055	AP-42 3.4 (10/96)	5.90	8,760	25.84
		hp	SO <sub>2</sub>						0.00040	AP-42 3.4 (10/96)	0.43	8,760	1.90
			PM						0.0007	AP-42 3.4 (10/96)	0.75	8,760	3.29
			PM <sub>10</sub>						0.0007	AP-42 3.4 (10/96)	0.75	8,760	3.29
			PM <sub>2.5</sub>						0.0007	AP-42 3.4 (10/96)	0.75	8,760	3.29
			CO <sub>2</sub> e						163.6	lb/MMBtu-USEPA	440.76	8,760	1930.52
HPVGTS Heater	DB-1813	15.0	NOx	100	0.098	1.47	8,760	6.4					
			VOC	5.5	0.005	0.08	8,760	0.4					
			CO	84	0.082	1.24	8,760	5.4					
		MMBtu/hr	SO <sub>2</sub>	0.6	0.001	0.01	8,760	0.04					
			PM	7.6	0.007	0.11	8,760	0.5					
			PM <sub>10</sub>	7.6	0.007	0.11	8,760	0.5					
			PM <sub>2.5</sub>	7.6	0.007	0.11	8,760	0.5					
			CO <sub>2</sub> e	----	117,000	1,755.00	8,760	7,687.0					
EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (lb/hr)	POLLUTANT EMITTED	POLLUTANT EF (% Removal)	EMISSION FACTOR REFERENCE	HOURLY EMISSION (lb/hr)	PERMIT OPERATE (hpy)	ANNUAL EMISSION (tpy)	COMMENTS				
HPVGTS	DR-1814/ DT-1821	175	VOC	0%	Based on controlled & efficiency	175.00	8,760	766.5	Assume 0 Removal for control devic				
		1500	CO	0%		1,500.2	8,760	6,571.5					
		2300	CO <sub>2</sub> e	0		2,300	8,760	10,074.0					
Low Pressure Absorber	DT-302	8.9	VOC		Recovery device so based on controlled emissions	8.85	8,760	38.8	Recovery Device				
		3.5	CO			3.47	8,760	15.2					
		231.7	CO <sub>2</sub> e			231.7	8,760	1,014.9					
Intermediate Silo Scrubber	DT-500	10.4	PM	0	Based on controlled & efficiency	10.37	8,760	45.4	Assume 0 Removal for control devic				
			PM <sub>10</sub>	0		10.37	8,760	45.4					
			PM <sub>2.5</sub>	0		10.37	8,760	45.4					
CRU Extraction Drum	DD-412	CRU removed	VOC						CRU is being removed				
CRU Waste Slurry Drum	DD-413		VOC										
CRU Mother Liquor Drum	DD-414		VOC										
CRU Evaporation Drum	DE-416		VOC										
Process Fugitives			VOC		USEPA LDAR EF	48.38	8,760	211.9	Assumes No LDAR program				

Table B-14  
#2 OX Uncontrolled Pre- and Post-Project PTE Emissions

**PTE - Uncontrolled Pre-Project**

NATURAL GAS										DIESEL FUEL (SULFUR = 0.05%)				
EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM FIRE RATE	POLLUTANT EMITTED	AP-42 1.4 FACTOR (lb/MM scf)	NATURAL GAS EF (lb/MMBtu)	HOURLY EMISSION (lb/hr)	UNCONTROL OPERATE (hpy)	ANNUAL EMISSION (tpy)	AP-42 FACTOR (lb/hp-hr)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	UNCONTROL OPERATE (hpy)	ANNUAL EMISSION (tpy) - Oil	
Emergency Generator #3	DM-135	1072.8	NOx						0.024	AP-42 3.4 (10/96)	25.75	8,760	112.77	
			VOC						0.000642	AP-42 3.4 (10/96)	0.69	8,760	3.01	
			CO						0.0055	AP-42 3.4 (10/96)	5.90	8,760	25.84	
		hp	SO <sub>2</sub>						0.00040	AP-42 3.4 (10/96)	0.43	8,760	1.90	
			PM						0.0007	AP-42 3.4 (10/96)	0.75	8,760	3.29	
			PM <sub>10</sub>						0.0007	AP-42 3.4 (10/96)	0.75	8,760	3.29	
			PM <sub>2.5</sub>						0.0007	AP-42 3.4 (10/96)	0.75	8,760	3.29	
			CO <sub>2</sub> e						163.6	lb/MMBtu-USEPA	440.76	8,760	1930.52	
HPVGTS Heater	DB-1813	15.0	NOx	100	0.098	1.47	8,760	6.4						
			VOC	5.5	0.005	0.08	8,760	0.4						
			CO	84	0.082	1.24	8,760	5.4						
		MMBtu/hr	SO <sub>2</sub>	0.6	0.001	0.01	8,760	0.04						
			PM	7.6	0.007	0.11	8,760	0.5						
			PM <sub>10</sub>	7.6	0.007	0.11	8,760	0.5						
			PM <sub>2.5</sub>	7.6	0.007	0.11	8,760	0.5						
			CO <sub>2</sub> e	----	117.000	1,755.00	8,760	7,687.0						
EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (lb/hr)	POLLUTANT EMITTED	POLLUTANT EF (% Removal)	EMISSION FACTOR REFERENCE	HOURLY EMISSION (lb/hr)	PERMIT OPERATE (hpy)	ANNUAL EMISSION (tpy)	COMMENTS					
HPVGTS	DR-1814/ DT-1821	175	VOC	0%	Based on controlled & efficiency	175.0	8,760	766.5	Assume 0 Removal for control device					
		1500	CO	0%		1,500.0	8,760	6,570.4						
		2300	CO <sub>2</sub> e	0		2,300	8,760	10,074.0						
Low Pressure Absorber	DT-302	8.9	VOC		Recovery device so based on controlled emissions	8.85	8,760	38.8	Recovery Device					
		3.5	CO			3.47	8,760	15.2						
		231.7	CO <sub>2</sub> e			231.7	8,760	1,014.9						
Intermediate Silo Scrubber	DT-500	10.4	PM	0	Based on controlled & efficiency	10.37	8,760	45.4	Assume 0 Removal for control device					
			PM <sub>10</sub>	0		10.37	8,760	45.4						
			PM <sub>2.5</sub>	0		10.37	8,760	45.4						
CRU Extraction Drum	DD-412	CRU removed	VOC			0.01	8,760	0.02	CRU is being removed					
CRU Waste Slurry Drum	DD-413		VOC			0.04	8,760	0.2						
CRU Mother Liquor Drum	DD-414		VOC			0.04	8,760	0.2						
CRU Evaporation Drum	DE-416		VOC			1.04	8,760	4.5						
Process Fugitives			VOC		USEPA LDAR EF	44.58	8,760	195.2	Assumes No LDAR program					

TOTAL POST-PROJECT EMISSIONS - #2 OX PTE (tpy)				
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	FUGITIVE SOURCES (tpy)	TOTALS
NOx	0	119.2	N/A	119.2
VOC	805.3	3.4	211.9	1,020.5
CO	6,586.7	31.3	N/A	6,617.9
SO <sub>2</sub>	0	1.9	N/A	1.9
PM	45.4	3.8	N/A	49.2
PM <sub>10</sub>	45.4	3.8	N/A	49.2
PM <sub>2.5</sub>	45.4	3.8	N/A	49.2
CO <sub>2e</sub>	11,088.9	9,617.5	N/A	20,706.5

TOTAL PRE-PROJECT EMISSIONS - #2 OX PTE (tpy)				
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	FUGITIVE SOURCES (tpy)	TOTALS
NOx	0	119.2	N/A	119.2
VOC	810.2	3.4	195.2	1,008.8
CO	6,585.6	31.3	N/A	6,616.9
SO <sub>2</sub>	0	1.9	N/A	1.9
PM	45.4	3.8	N/A	49.2
PM <sub>10</sub>	45.4	3.8	N/A	49.2
PM <sub>2.5</sub>	45.4	3.8	N/A	49.2
CO <sub>2e</sub>	11,088.9	9,617.5	N/A	20,706.5

Table B-15  
CR #1 PTA Uncontrolled Pre- and Post-Project PTE Emissions

**PTE - Uncontrolled Post-Project**

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (cfm)	POLLUTANT EMITTED	UNCONTROL EMISSION FACTOR (gr/cfm)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS * (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Feed Slurry Drum Scrubber	CH-108	-	PM	-	Based on controlled & efficiency	10.00	8,760	43.8	Assume 0 removal for control device
			PM <sub>10</sub>	-		10.00	8,760	43.8	
			PM <sub>2.5</sub>	-		10.00	8,760	43.8	
Crystallizer Vent Scrubber	CM-301	-	VOC	-	Source Test	10.62	8,760	46.5	Assume 0 removal for control device
			PM	-	Based on controlled & efficiency	121.00	8,760	530.0	
			PM <sub>10</sub>	-		121.00	8,760	530.0	
Dryer Scrubber	CM-404A	-	PM	-	Based on controlled & efficiency	30.00	8,760	131.4	Assume 0 removal for control device
			PM <sub>10</sub>	-		30.00	8,760	131.4	
			PM <sub>2.5</sub>	-		30.00	8,760	131.4	
Dryer Scrubber	CM-404B	-	PM	-	Based on controlled & efficiency	30.00	8,760	131.4	Assume 0 removal for control device
			PM <sub>10</sub>	-		30.00	8,760	131.4	
			PM <sub>2.5</sub>	-		30.00	8,760	131.4	
Day Silo Baghouse	CM-603A	4,950	PM	1.00	USEPA Handbook	42.43	8,760	185.8	Assume 0 removal for control device
			PM <sub>10</sub>	1.00	USEPA Handbook	42.43	8,760	185.8	
			PM <sub>2.5</sub>	1.00	USEPA Handbook	42.43	8,760	185.8	
Day Silo Baghouse	CM-603B	4,950	PM	1.00	USEPA Handbook	42.43	8,760	185.8	Assume 0 removal for control device
			PM <sub>10</sub>	1.00	USEPA Handbook	42.43	8,760	185.8	
			PM <sub>2.5</sub>	1.00	USEPA Handbook	42.43	8,760	185.8	
Rotary Lock A Dust Collector	CM-608A	100	PM	1.00	USEPA Handbook	0.86	8,760	3.8	Assume 0 removal for control device
			PM <sub>10</sub>	1.00	USEPA Handbook	0.86	8,760	3.8	
			PM <sub>2.5</sub>	1.00	USEPA Handbook	0.86	8,760	3.8	
Rotary Lock B Dust Collector	CM-608B	100	PM	1.00	USEPA Handbook	0.86	8,760	3.8	Assume 0 removal for control device
			PM <sub>10</sub>	1.00	USEPA Handbook	0.86	8,760	3.8	
			PM <sub>2.5</sub>	1.00	USEPA Handbook	0.86	8,760	3.8	



Table B-15  
CR #1 PTA Uncontrolled Pre- and Post-Project PTE Emissions

**PTE - Uncontrolled Pre-Project**

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (cfm)	POLLUTANT EMITTED	UNCONTROL EMISSION FACTOR (gr/cfm)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS* (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Feed Slurry Drum Scrubber	CH-108	-	PM	-	Based on controlled & efficiency	10.00	8,760	43.8	Assume 0 removal for control device
			PM <sub>10</sub>	-		10.00	8,760	43.8	
			PM <sub>2.5</sub>	-		10.00	8,760	43.8	
Crystallizer Vent Scrubber	CM-301	-	VOC	-	Source Test	7.00	8,760	30.7	Assume 0 removal for control device
			PM	-	Based on controlled & efficiency	180.00	8,760	788.4	
			PM <sub>10</sub>	-		180.00	8,760	788.4	
Dryer Scrubber	CM-404A	-	PM	-	Based on controlled & efficiency	30.00	8,760	131.4	Assume 0 removal for control device
			PM <sub>10</sub>	-		30.00	8,760	131.4	
			PM <sub>2.5</sub>	-		30.00	8,760	131.4	
Dryer Scrubber	CM-404B	-	PM	-	Based on controlled & efficiency	30.00	8,760	131.4	Assume 0 removal for control device
			PM <sub>10</sub>	-		30.00	8,760	131.4	
			PM <sub>2.5</sub>	-		30.00	8,760	131.4	
Day Silo Baghouse	CM-603A	4,950	PM	1.00	USEPA Handbook	42.43	8,760	185.8	Assume 0 removal for control device
			PM <sub>10</sub>	1.00	USEPA Handbook	42.43	8,760	185.8	
			PM <sub>2.5</sub>	1.00	USEPA Handbook	42.43	8,760	185.8	
Day Silo Baghouse	CM-603B	4,950	PM	1.00	USEPA Handbook	42.43	8,760	185.8	Assume 0 removal for control device
			PM <sub>10</sub>	1.00	USEPA Handbook	42.43	8,760	185.8	
			PM <sub>2.5</sub>	1.00	USEPA Handbook	42.43	8,760	185.8	
Rotary Lock A Dust Collector	CM-608A	100	PM	1.00	USEPA Handbook	0.86	8,760	3.8	Assume 0 removal for control device
			PM <sub>10</sub>	1.00	USEPA Handbook	0.86	8,760	3.8	
			PM <sub>2.5</sub>	1.00	USEPA Handbook	0.86	8,760	3.8	
Rotary Lock B Dust Collector	CM-608B	100	PM	1.00	USEPA Handbook	0.86	8,760	3.8	Assume 0 removal for control device
			PM <sub>10</sub>	1.00	USEPA Handbook	0.86	8,760	3.8	
			PM <sub>2.5</sub>	1.00	USEPA Handbook	0.86	8,760	3.8	

TOTAL POST-PROJECT EMISSIONS - #1 PTA (tpy)			
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	TOTALS
NOx	0	NA	0
VOC	46.5	NA	46.5
CO	0	NA	0
SO <sub>2</sub>	0	NA	0
PM	1,215.8	NA	1,215.8
PM <sub>10</sub>	1,215.8	NA	1,215.8
PM <sub>2.5</sub>	1,215.8	NA	1,215.8

\*Using stack test data and a 99% control device efficiency for PM

TOTAL PRE-PROJECT EMISSIONS - #1 PTA (tpy)			
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	TOTALS
NOx	0	NA	0
VOC	30.7	NA	30.7
CO	0	NA	0
SO <sub>2</sub>	0	NA	0
PM	1,474.2	NA	1,474.2
PM <sub>10</sub>	1,474.2	NA	1,474.2
PM <sub>2.5</sub>	1,474.2	NA	1,474.2

Table B-16  
CR #2 PTA Uncontrolled Pre- and Post-Project PTE Emissions

**PTE - Uncontrolled Post-Project**

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (lb/hr)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR (% Removal)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS* (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Feed Slurry Drum Scrubber	DH-518	4	PM	0	Based on controlled & efficiency	4.00	8,760	17.5	Assume 0 removal for control device
			PM <sub>10</sub>	0		4.00	8,760	17.5	
			PM <sub>2.5</sub>	0		4.00	8,760	17.5	
Crystallizer Vent Scrubber	DM-601	54	PM	0	Based on controlled & efficiency	54.00	8,760	236.5	Assume 0 removal for control device
		54	PM <sub>10</sub>	0		54.00	8,760	236.5	
		54	PM <sub>2.5</sub>	0		54.00	8,760	236.5	
		10.6	VOC	0	Source Test	10.60	8,760	46.4	
Dryer Scrubber	DM-704	5.2	PM	0	Based on controlled & efficiency	5.20	8,760	22.8	Assume 0 removal for control device
			PM <sub>10</sub>	0		5.20	8,760	22.8	
			PM <sub>2.5</sub>	0		5.20	8,760	22.8	
Day Silo Dust Collector	DM-797A	265	PM	0	Based on controlled & efficiency	265.00	8,760	1,160.7	Assume 0 removal for control device
			PM <sub>10</sub>	0		265.00	8,760	1,160.7	
			PM <sub>2.5</sub>	0		265.00	8,760	1,160.7	
Day Silo Dust Collector	DM-797B	265	PM	0	Based on controlled & efficiency	265.00	8,760	1,160.7	Assume 0 removal for control device
			PM <sub>10</sub>	0		265.00	8,760	1,160.7	
			PM <sub>2.5</sub>	0		265.00	8,760	1,160.7	
Product Recovery Unit	MLSR-2		PM	0	Based on controlled & efficiency	0.100	8,760	0.4	Assume 0 removal for control device
			PM <sub>10</sub>	0		0.100	8,760	0.4	
			PM <sub>2.5</sub>	0		0.100	8,760	0.4	

Table B-16  
CR #2 PTA Uncontrolled Pre- and Post-Project PTE Emissions

**PTE - Uncontrolled Pre-Project**

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (lb/hr)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR (% Removal)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS* (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Feed Slurry Drum Scrubber	DH-518	4	PM	0	Based on controlled & efficiency	4.00	8,760	17.5	Assume 0 removal for control device
			PM <sub>10</sub>	0		4.00	8,760	17.5	
			PM <sub>2.5</sub>	0		4.00	8,760	17.5	
Crystallizer Vent Scrubber	DM-601	54	PM	0	Based on controlled & efficiency	54.00	8,760	236.5	Assume 0 removal for control device
		54	PM <sub>10</sub>	0		54.00	8,760	236.5	
		54	PM <sub>2.5</sub>	0		54.00	8,760	236.5	
		7	VOC	0	Source Test	7.00	8,760	30.7	
Dryer Scrubber	DM-704	5.2	PM	0	Based on controlled & efficiency	5.20	8,760	22.8	Assume 0 removal for control device
			PM <sub>10</sub>	0		5.20	8,760	22.8	
			PM <sub>2.5</sub>	0		5.20	8,760	22.8	
Day Silo Dust Collector	DM-797A	265	PM	0	Based on controlled & efficiency	265.00	8,760	1,160.7	Assume 0 removal for control device
			PM <sub>10</sub>	0		265.00	8,760	1,160.7	
			PM <sub>2.5</sub>	0		265.00	8,760	1,160.7	
Day Silo Dust Collector	DM-797B	265	PM	0	Based on controlled & efficiency	265.00	8,760	1,160.7	Assume 0 removal for control device
			PM <sub>10</sub>	0		265.00	8,760	1,160.7	
			PM <sub>2.5</sub>	0		265.00	8,760	1,160.7	
Product Recovery Unit	MLSR-2		PM	0	Based on controlled & efficiency	0.100	8,760	0.4	Assume 0 removal for control device
			PM <sub>10</sub>	0		0.100	8,760	0.4	
			PM <sub>2.5</sub>	0		0.100	8,760	0.4	

TOTAL POST-PROJECT EMISSIONS - #2 PTA (tpy)			
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	TOTALS
NOx	0	NA	0
VOC	46.4	NA	46.4
CO	0	NA	0
SO <sub>2</sub>	0	NA	0
PM	2,598.7	NA	2,598.7
PM <sub>10</sub>	2,598.7	NA	2,598.7
PM <sub>2.5</sub>	2,598.7	NA	2,598.7

\*Using stack test data and a 99% control device efficiency for PM

TOTAL PRE-PROJECT EMISSIONS - #2 PTA (tpy)			
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	TOTALS
NOx	0	NA	0
VOC	30.7	NA	30.7
CO	0	NA	0
SO <sub>2</sub>	0	NA	0
PM	2,598.7	NA	2,598.7
PM <sub>10</sub>	2,598.7	NA	2,598.7
PM <sub>2.5</sub>	2,598.7	NA	2,598.7

Table B-17  
Cooling Towers Uncontrolled Pre- and Post-Project PTE Emissions

**PTE - Uncontrolled Post-Project**

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (gpm)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR (% Removal)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Cooling Tower	AT-201	97000	PM	0	Table B-30	14.56	8,760	63.8	Reisman, Frisbie, 2002
			PM <sub>10</sub>	0	Table B-30	10.57	8,760	46.3	Reisman, Frisbie, 2002
			PM <sub>2.5</sub>	0	Table B-30	0.03	8,760	0.1	Reisman, Frisbie, 2002
Cooling Tower	AT-202	97000	PM	0	Table B-30	14.56	8,760	63.8	Reisman, Frisbie, 2002
			PM <sub>10</sub>	0	Table B-30	10.57	8,760	46.3	Reisman, Frisbie, 2002
			PM <sub>2.5</sub>	0	Table B-30	0.03	8,760	0.1	Reisman, Frisbie, 2002

**PTE - Uncontrolled Pre-Project**

Cooling Tower	AT-201	68000	PM	0	Table B-30	10.21	8,760	44.7	Reisman, Frisbie, 2002
			PM <sub>10</sub>	0	Table B-30	7.41	8,760	32.5	Reisman, Frisbie, 2002
			PM <sub>2.5</sub>	0	Table B-30	0.02	8,760	0.1	Reisman, Frisbie, 2002
Cooling Tower	AT-202	68000	PM	0	Table B-30	10.21	8,760	44.7	Reisman, Frisbie, 2002
			PM <sub>10</sub>	0	Table B-30	7.41	8,760	32.5	Reisman, Frisbie, 2002
			PM <sub>2.5</sub>	0	Table B-30	0.02	8,760	0.1	Reisman, Frisbie, 2002

TOTAL POST-PROJECT EMISSIONS - #2 PTA (tpy)			
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	TOTALS
NO <sub>x</sub>	0	NA	0
VOC	0	NA	0
CO	0	NA	0
SO <sub>2</sub>	0	NA	0
PM	127.6	NA	127.6
PM <sub>10</sub>	92.6	NA	92.6
PM <sub>2.5</sub>	0.3	NA	0.3

TOTAL PRE-PROJECT EMISSIONS - #2 PTA (tpy)			
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	TOTALS
NO <sub>x</sub>	0	NA	0
VOC	0	NA	0
CO	0	NA	0
SO <sub>2</sub>	0	NA	0
PM	89.4	NA	89.4
PM <sub>10</sub>	64.9	NA	64.9
PM <sub>2.5</sub>	0.2	NA	0.2

Table B-18  
Fugitive Uncontrolled Pre- and Post-Project PTE Emissions

**Post-Project-Uncontrolled (No LDAR Program)**

	VALVES, LIQUID	VALVES, GAS	FLANGES DRAINS, VENTS & OTHERS	PUMPS	RELIEF VALVES	AGITATORS	COMPRESSORS	TOTAL HAPS EMISSIONS (lb/yr)	TOTAL STREAM (lb/yr)	TOTAL STREAM (tpy)
EF, lb/hr/item	0.0089	0.0132	0.0040	0.0439	0.2293	0.0439	0.0439			
#1 OX Unit (HON)	218	0	398	4	3	1	0	11691.44	38971	19.49
#1 OX (NSPS as HON)	2023	85	4215	34	17	18	5	4641.39	372230	186.12
#2 OX (HON)	244	0	534	3	4	1	0	14234.37	47432	23.72
#2 OX (NSPS as HON)	1960	202	4325	37	13	15	4	4693.26	376390	188.19
OSBL (HON)	303	1	588	6	4	0	0	54818.52	54819	27.41
<b>Total</b>	<b>4748.11</b>	<b>288.11</b>	<b>10060.10</b>	<b>84.04</b>	<b>41.23</b>	<b>35.04</b>	<b>9.04</b>	<b>90,079</b>	<b>889,842</b>	<b>444.92</b>

Project LDAR Impact

**10.00%**

	USEPA Factor		EF
Factors	kg/hr	lb/kg	lb/hr
Valves, Liquid	0.00403	2.204623	0.00888
Valves, Gas	0.00597	2.204623	0.01316
Flanges , Drains, Vents, Other	0.00183	2.204623	0.00403
Pumps	0.01990	2.204623	0.04387
Relief Valves	0.10400	2.204623	0.22928
Agitators	0.01990	2.204623	0.04387
Compressors	0.01990	2.204623	0.04387
Sample Connection	0.01500	2.204623	0.03307

USEPA Factor is based on table 2-1 from USEPA Report of 1995 on LDAR Emission factors - Average Emission Factors

Effectiveness factors - HON are based on Table 5-9 from 1995 USEPA Report, NSPS from EIIP Volume II, Table 4.2.2

**Pre-Project-Uncontrolled (No LDAR Program)**

	VALVES, LIQUID	VALVES, GAS	FLANGES DRAINS, VENTS & OTHERS	PUMPS	RELIEF VALVES	AGITATORS	COMPRESSORS	TOTAL HAPS EMISSIONS (lb/yr)	TOTAL STREAM (lb/yr)	TOTAL STREAM (tpy)
EF, lb/hr/item	0.0089	0.0132	0.0040	0.0439	0.2293	0.0439	0.0439			
#1 OX Unit (HON)	198	0	362	4	3	1	0	10845.32	36151	18.08
#1 OX (NSPS as HON)	1839	77	3678	34	17	18	5	4215.12	338044	169.02
#2 OX (HON)	222	0	485	3	4	1	0	13201.46	43990	22.00
#2 OX (NSPS as HON)	1782	184	3932	37	13	15	4	4320.59	346503	173.25
OSBL (HON)	303	1	588	6	4	0	0	54818.52	54819	27.41
<b>Total</b>	<b>4344.01</b>	<b>262.01</b>	<b>9045.00</b>	<b>84.04</b>	<b>41.23</b>	<b>35.04</b>	<b>9.04</b>	<b>87,401</b>	<b>819,507</b>	<b>409.75</b>

## Pre-Project Controlled Emissions

Table B-19  
Facility Pre-Project Controlled PTE Data Summary

**Pre-Project Controlled PTE Emissions (tpy)**

POLLUTANTS	CR #1 OX	CR #2 OX	CR #1 PTA	CR #2 PTA	COOLING TOWER	TOTAL
NOx	0.5	12.9	0	0	0	13.4
VOC	441.8	164.1	30.7	30.7	0	667.2
CO	1,890.1	357.6	0	0	0	2,247.7
SO <sub>2</sub>	0.03	0.1	0	0	0	0.2
PM	9.5	1.1	15.1	6.0	2.7	34.4
PM <sub>10</sub>	9.5	1.1	15.1	6.0	1.9	33.7
PM <sub>2.5</sub>	9.5	1.1	15.1	6.0	0.01	31.8
CO <sub>2</sub> e	54,143	40,713	-	-	-	94,856

**Pre-Project Facility-Wide PTE**

POLLUTANTS	MODIFIED UNITS	UNMODIFIED UNITS	FACILITY TOTAL
NOx	13.4	311.2	324.6
VOC	667.2	89.8	757.0
CO	2,247.7	286.1	2,533.8
SO <sub>2</sub>	0.2	188.9	189.1
PM	34.4	47.4	81.8
PM <sub>10</sub>	33.7	44.3	78.0
PM <sub>2.5</sub>	31.8	42.0	73.8
CO <sub>2</sub> e	94,856	418,175	513,031

Table B-20  
CR #1 OX Pre-Project PTE Emissions

#1 OX PTE - Pre-Project Emissions

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM FIRE RATE (HP)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR	UNITS	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Emergency Generator #2	BM-1201	335	NOx	0.031	lb/hp-hr	AP-42 3.3 (10/96)	10.385	100	0.5	Diesel Fuel Sulfur = 0.05%, Hours per RICE MACT limit
			VOC	0.00251	lb/hp-hr	AP-42 3.3 (10/96)	0.842	100	0.04	
			CO	0.00668	lb/hp-hr	AP-42 3.3 (10/96)	2.238	100	0.1	
			SO <sub>2</sub>	0.00205	lb/hp-hr	AP-42 3.3 (10/96)	0.687	100	0.03	
			PM	0.0022	lb/hp-hr	AP-42 3.3 (10/96)	0.737	100	0.04	
			PM <sub>10</sub>	0.0022	lb/hp-hr	AP-42 3.3 (10/96)	0.737	100	0.04	
			PM <sub>2.5</sub>	0.0022	lb/hp-hr	AP-42 3.3 (10/96)	0.737	100	0.04	
			CO <sub>2</sub> e	163.6	lb/MMBtu	USEPA Data	137.634	100	6.9	
HPVGTS	HPVGTS-1	131	VOC	85.0	% Removal	Vendor Data	19.65	8,760	87.0	Hourly rates don't match annual emissions.
		234	CO	85.0	% Removal	Vendor Data	35.10	8,760	1,470.0	
		10000.0	CO <sub>2</sub> e	0	% Removal	BP calc/USEPA Data	11250	8,760	49,275.0	
Low Pressure Absorber	BT-603	18.2	VOC			BP Calcs	18.20	8,760	80	Recovery Device
		9	CO			BP Calcs	9.13	8,760	40.0	
		400.0	CO <sub>2</sub> e			USEPA Data	400.0	8,760	1,752.0	
CRU Extraction Drum	BD-625	CRU will be removed	VOC			BP Calcs	1.0	8,760	4.4	Project will remove CRU
CRU Surge Drum	BD-631		VOC			BP Calcs	4.0	8,760	17.5	
CRU Waste Slurry Drum	BD-632		VOC			BP Calcs	0.003	8,760	0.01	
Silo Scrubber	BT-501		PM	98	% Removal	Source Test	2.16	8,760	9.5	
			PM <sub>10</sub>	98	% Removal	Source Test	2.16	8,760	9.5	
			PM <sub>2.5</sub>	98	% Removal	Source Test	2.16	8,760	9.5	
CRU Evaporator Overhd Condenser	BE-645	CRU will be removed	VOC			BP Calcs	0.3	8,760	1.3	Project will remove CRU
DHT Ovhd Scrubber	BT-702	Vent will be removed	VOC			BP Calcs	60.0	8,760	165.0	Project will remove vent - VOC hourly rates don't match annual
			CO			BP Calcs	87.0	8,760	380.0	
			CO <sub>2</sub> e			BP calc/USEPA Data	711.4	8,760	3,115.9	
Process Fugitives			VOC			USEPA LDAR EF	19.8	8,760	86.8	

TOTAL PRE-PROJECT EMISSIONS - #1 OX PTE (tpy)				
POLLUTANT	PROCESS SOURCES	COMBUSTION SOURCES	FUGITIVE SOURCES	TOTALS
NOx	0	0.5	N/A	0.5
VOC	354.9	0.04	86.8	441.8
CO	1,890.0	0.1	N/A	1,890.1
SO <sub>2</sub>	0	0.03	N/A	0.03
PM	9.5	0.04	N/A	9.5
PM <sub>10</sub>	9.5	0.04	N/A	9.5
PM <sub>2.5</sub>	9.5	0.04	N/A	9.5
CO <sub>2</sub> e	54,142.9	6.9	N/A	54,149.8



Table B-21  
#2 OX Pre-Project PTE Emissions

#2 OX PTE - Pre-Project Emissions

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM FIRE RATE	POLLUTANT EMITTED	NATURAL GAS					DIESEL FUEL (SULFUR = 0.05%)				
				AP-42 1.4 FACTOR (lb/MM scf)	NATURAL GAS EF (lb/MMBtu)	HOURLY EMISSION (lb/hr)	PERMIT OPERATE (hpy)	ANNUAL EMISSION (tpy)	AP-42 FACTOR (lb/hp-hr)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMIT OPERATE (hpy)	Annual Emission (tpy) - Oil
Emergency Generator #3	DM-135	1072.8	NOx						0.024	AP-42 3.4 (10/96)	25.75	500	6.44
			VOC						0.000642	AP-42 3.4 (10/96)	0.69	500	0.17
			CO						0.0055	AP-42 3.4 (10/96)	5.90	500	1.48
		hp	SO <sub>2</sub>						0.00040	AP-42 3.4 (10/96)	0.43	500	0.11
			PM						0.0007	AP-42 3.4 (10/96)	0.75	500	0.19
			PM <sub>10</sub>						0.0007	AP-42 3.4 (10/96)	0.75	500	0.19
			PM <sub>2.5</sub>						0.0007	AP-42 3.4 (10/96)	0.75	500	0.19
			CO <sub>2</sub> e						163.6	lb/MMBtu-USEPA	440.76	500	110.19
HPVGTS Heater	DB-1813	15.0	NOx	100	0.098	1.47	8,760	6.4					
			VOC	5.5	0.005	0.08	8,760	0.4					
			CO	84	0.082	1.24	8,760	5.4					
		MMBtu/hr	SO <sub>2</sub>	0.6	0.001	0.01	8,760	0.04					
			PM	7.6	0.007	0.11	8,760	0.5					
			PM <sub>10</sub>	7.6	0.007	0.11	8,760	0.5					
			PM <sub>2.5</sub>	7.6	0.007	0.11	8,760	0.5					
			CO <sub>2</sub> e	----	117.000	1,755.00	8,760	7,687.0					
EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (lb/hr)	POLLUTANT EMITTED	POLLUTANT EF (% Removal)	EMISSION FACTOR REFERENCE	HOURLY EMISSION (lb/hr)	PERMIT OPERATE (hpy)	ANNUAL EMISSION (tpy)	COMMENTS				
HPVGTS	DR-1814/ DT-1821	285	VOC	98%	Vendor Data	5.70	8,760	25.0					
		1589	CO	95%	BP Calcs	79.5	8,760	348.4					
		5000	CO <sub>2</sub> e	0	BP calc/USEPA Data	7,500.00	8,760	32,850.0					
Low Pressure Absorber	DT-302	10.5	VOC		BP Calcs	10.48	8,760	45.9					
		0.5	CO		BP Calcs	0.52	8,760	2.3					
		15.0	CO <sub>2</sub> e		BP calc/USEPA Data	15.0	8,760	65.8					
Intermediate Silo Scrubber	DT-500	10.4	PM	99	BP Calcs	0.10	8,760	0.5					
			PM <sub>10</sub>	99	BP Calcs	0.10	8,760	0.5					
			PM <sub>2.5</sub>	99	BP Calcs	0.10	8,760	0.5					
CRU Extraction Drum	DD-412	CRU will be removed	VOC		BP Calcs	0.01	8,760	0.02	Project will remove CRU				
CRU Waste Slurry Drum	DD-413		VOC		BP Calcs	0.04	8,760	0.2					
CRU Mother Liquor Drum	DD-414		VOC		BP Calcs	0.04	8,760	0.2					
CRU Evaporation Drum	DE-416		VOC		BP Calcs	1.04	8,760	4.5					
Process Fugitives			VOC		USEPA LDAR EF	20.1	8,760	87.8					

TOTAL PRE-PROJECT EMISSIONS - #2 OX PTE (tpy)				
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	FUGITIVE SOURCES (tpy)	TOTALS
NOx	0	12.9	N/A	12.9
VOC	75.8	0.5	87.8	164.1
CO	350.7	6.9	N/A	357.6
SO <sub>2</sub>	0	0.1	N/A	0.1
PM	0.5	0.7	N/A	1.1
PM <sub>10</sub>	0.5	0.7	N/A	1.1
PM <sub>2.5</sub>	0.5	0.7	N/A	1.1
CO <sub>2</sub> e	32,915.8	7797.2	N/A	40,713.0

Table B-22  
CR #1 PTA Pre-Project PTE Emissions

#1 PTA PTE - Pre-Project Emissions

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (cfm)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR (gr/cfm)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Feed Slurry Drum Scrubber	CH-108	-	PM	-	Source Test	0.10	8,760	0.4	
			PM <sub>10</sub>	-	Source Test	0.10	8,760	0.4	
			PM <sub>2.5</sub>	-	Source Test	0.10	8,760	0.4	
Crystallizer Vent Scrubber	CM-301	-	VOC	-	Source Test	7.00	8,760	30.7	
			PM	-	Source Test	1.80	8,760	7.9	
			PM <sub>10</sub>	-	Source Test	1.80	8,760	7.9	
			PM <sub>2.5</sub>	-	Source Test	1.80	8,760	7.9	
Dryer Scrubber	CM-404A	-	PM	-	Source Test	0.30	8,760	1.3	
			PM <sub>10</sub>	-	Source Test	0.30	8,760	1.3	
			PM <sub>2.5</sub>	-	Source Test	0.30	8,760	1.3	
Dryer Scrubber	CM-404B		PM	-	Source Test	0.30	8,760	1.3	
			PM <sub>10</sub>	-	Source Test	0.30	8,760	1.3	
			PM <sub>2.5</sub>	-	Source Test	0.30	8,760	1.3	
Day Silo Baghouse	CM-603A	4,950	PM	0.01	USEPA Handbook	0.42	8,760	1.9	
			PM <sub>10</sub>	0.01	USEPA Handbook	0.42	8,760	1.9	
			PM <sub>2.5</sub>	0.01	USEPA Handbook	0.42	8,760	1.9	
Day Silo Baghouse	CM-603B	4,950	PM	0.01	USEPA Handbook	0.42	8,760	1.9	
			PM <sub>10</sub>	0.01	USEPA Handbook	0.42	8,760	1.9	
			PM <sub>2.5</sub>	0.01	USEPA Handbook	0.42	8,760	1.9	
Rotary Lock A Dust Collector	CM-608A	600	PM	0.01	USEPA Handbook	0.05	8,760	0.2	
			PM <sub>10</sub>	0.01	USEPA Handbook	0.05	8,760	0.2	
			PM <sub>2.5</sub>	0.01	USEPA Handbook	0.05	8,760	0.2	
Rotary Lock B Dust Collector	CM-608B	600	PM	0.01	USEPA Handbook	0.05	8,760	0.2	
			PM <sub>10</sub>	0.01	USEPA Handbook	0.05	8,760	0.2	
			PM <sub>2.5</sub>	0.01	USEPA Handbook	0.05	8,760	0.2	

TOTAL PRE-PROJECT EMISSIONS - #1 PTA PTE (tpy)			
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	TOTALS
NOx	0	NA	0
VOC	30.7	NA	30.7
CO	0	NA	0
SO <sub>2</sub>	0	NA	0
PM	15.1	NA	15.12
PM <sub>10</sub>	15.1	NA	15.12
PM <sub>2.5</sub>	15.1	NA	15.12

Table B-23  
CR #2 PTA Pre-Project PTE Emissions

**#2 PTA PTE - Pre-Project Emissions**

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (lb/hr)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR (% Removal)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Feed Slurry Drum Scrubber	DH-518	4	PM	99	Vendor Data	0.04	8,760	0.2	Maximum rate based on hourly emissions and % removal
			PM <sub>10</sub>	99	Vendor Data	0.04	8,760	0.2	
			PM <sub>2.5</sub>	99	Vendor Data	0.04	8,760	0.2	
Crystallizer Vent Scrubber	DM-601	54	PM	99	Vendor Data	0.54	8,760	2.4	Maximum PM rates based on hourly emissions and % removal
		54	PM <sub>10</sub>	99	Vendor Data	0.54	8,760	2.4	
		54	PM <sub>2.5</sub>	99	Vendor Data	0.54	8,760	2.4	
		25.5	VOC	0	Source Test	7.00	8,760	30.7	
Dryer Scrubber	DM-704	5.2	PM	95	Vendor Data	0.26	8,760	1.1	Maximum rate based on hourly emissions and % removal
			PM <sub>10</sub>	95	Vendor Data	0.26	8,760	1.1	
			PM <sub>2.5</sub>	95	Vendor Data	0.26	8,760	1.1	
Day Silo Dust Collector	DM-797A	265	PM	99.9	Vendor Data	0.27	8,760	1.2	Maximum rate based on hourly emissions and % removal
			PM <sub>10</sub>	99.9	Vendor Data	0.27	8,760	1.2	
			PM <sub>2.5</sub>	99.9	Vendor Data	0.27	8,760	1.2	
Day Silo Dust Collector	DM-797B	265	PM	99.9	Vendor Data	0.27	8,760	1.2	Maximum rate based on hourly emissions and % removal
			PM <sub>10</sub>	99.9	Vendor Data	0.27	8,760	1.2	
			PM <sub>2.5</sub>	99.9	Vendor Data	0.27	8,760	1.2	
Product Recovery Unit	MLSR-2		PM		BP Calcs	0.001	8,760	0.004	
			PM <sub>10</sub>		BP Calcs	0.001	8,760	0.004	
			PM <sub>2.5</sub>		BP Calcs	0.001	8,760	0.004	

TOTAL PRE-PROJECT EMISSIONS - #1 PTA PTE (tpy)			
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	TOTALS
NOx	0	NA	0
VOC	30.7	NA	30.7
CO	0	NA	0
SO <sub>2</sub>	0	NA	0
PM	6.0	NA	6.0
PM <sub>10</sub>	6.0	NA	6.0
PM <sub>2.5</sub>	6.0	NA	6.0

Table B-24  
Cooling Towers Pre-Project PTE Emissions

**Cooling Tower Pre-Project Controlled PTE Emissions (tpy)**

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (gpm)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR (% Removal)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Cooling Tower	AT-201	68000	PM	97	Table B-30	0.31	8,760	1.3	Reisman, Frisbie, 2002
			PM <sub>10</sub>	97	Table B-30	0.22	8,760	1.0	Reisman, Frisbie, 2002
			PM <sub>2.5</sub>	97	Table B-30	0.001	8,760	0.003	Reisman, Frisbie, 2002
Cooling Tower	AT-202	68000	PM	97	Table B-30	0.31	8,760	1.3	Reisman, Frisbie, 2002
			PM <sub>10</sub>	97	Table B-30	0.22	8,760	1.0	Reisman, Frisbie, 2002
			PM <sub>2.5</sub>	97	Table B-30	0.001	8,760	0.003	Reisman, Frisbie, 2002

TOTAL PRE-PROJECT EMISSIONS - COOLING TOWER (tpy)			
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	TOTALS
NOx	0	NA	0
VOC	0	NA	0
CO	0	NA	0
SO <sub>2</sub>	0	NA	0
PM	2.7	NA	2.7
PM <sub>10</sub>	1.9	NA	1.9
PM <sub>2.5</sub>	0.01	NA	0.01

Table B-25  
Fugitive Pre-Project PTE Emissions

**Facility Fugitives PTE - Pre-Project**

	VALVES, LIQUID	VALVES, GAS	FLANGES DRAINS, VENTS & OTHERS	PUMPS	RELIEF VALVES	AGITATORS	COMPRESSORS	% VOC	TOTAL HAPS EMISSIONS (lb/yr)	TOTAL STREAM (lb/yr)	TOTAL STREAM (tpy)
EF, lb/hr/item: (NSPS)	0.00347	0.00434	0.00270	0.01360	0.08942	0.01360	0.01360				
EF, lb/hr/item: (HON)	0.00107	0.00105	0.00028	0.01097	0.02751	0.01097	0.01097				
#1 OX Unit (HON)	198	0	362	4	3	1	0	100.0	1184.47	3948	1.97
#1 OX (NSPS)	1839	77	3832	34	17	18	5	100.0	2114.70	169595	84.80
#2 OX (HON)	222	0	485	3	4	1	0	100.0	1386.95	4622	2.31
#2 OX (NSPS)	1782	184	3932	37	13	15	4	100.0	2132.86	171052	85.53
OSBL (HON)	303	1	588	6	4	0	0	100.0	5834.33	5834	2.92
<b>Total</b>	<b>4344.00</b>	<b>262.01</b>	<b>9199.00</b>	<b>84.02</b>	<b>41.12</b>	<b>35.02</b>	<b>9.02</b>		<b>12,653</b>	<b>355,051</b>	<b>177.53</b>

Factors	USEPA Factor	lb/kg	EF	Effectiveness Factor	
	kg/hr		lb/hr	HON	NSPS
Valves, Liquid	0.00403	2.204623	0.00888	0.88	0.61
Valves, Gas	0.00597	2.204623	0.01316	0.92	0.67
Flanges , Drains, Vents, Other	0.00183	2.204623	0.00403	0.93	0.33
Pumps	0.01990	2.204623	0.04387	0.75	0.69
Relief Valves	0.10400	2.204623	0.22928	0.88	0.61
Agitators	0.01990	2.204623	0.04387	0.75	0.69
Compressors	0.01990	2.204623	0.04387	0.75	0.69
Sample Connection	0.01500	2.204623	0.03307	0.93	0.33

USEPA Factor is based on table 2-1 from USEPA Report of 1995 on LDAR Emission factors - Average Emission Factors

Effectiveness factors - HON are based on Table 5-9 from 1995 USEPA Report, NSPS from EIIP Volume II, Table 4.2.2

## Unmodified Units

Table B-26  
Unmodified Units  
Controlled and Uncontrolled PTE Emissions

**Controlled Emissions - tpy**

POLLUTANTS	SHIP AND LOAD	UTILITY	WWT	TOTAL
NO <sub>x</sub>	0	311.2	0	311.2
VOC	0	21.2	68.6	89.8
CO	0	286.1	0	286.1
SO <sub>2</sub>	0	188.9	0	188.9
PM	13.6	33.8	0	47.4
PM <sub>10</sub>	13.6	30.7	0	44.3
PM <sub>2.5</sub>	13.6	28.4	0	42.0
CO <sub>2</sub> e	0	418,174.8	0	418,174.8

**Uncontrolled Emissions - tpy**

POLLUTANTS	SHIP AND LOAD	UTILITY	WWT	TOTAL
NO <sub>x</sub>	0	311.2	0	311.2
VOC	0	21.2	68.6	89.8
CO	0	286.1	0	286.1
SO <sub>2</sub>	0	188.9	0	188.9
PM	1,362.2	33.8	0	1,396.0
PM <sub>10</sub>	1,362.2	30.7	0	1,392.9
PM <sub>2.5</sub>	1,362.3	28.4	0	1,390.7
CO <sub>2</sub> e	0	418,174.8	0	418,174.8

Table B-27  
Shipping -Loading Controlled and Uncontrolled PTE Emissions

Ship and Load - Controlled

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	STACK ID NUMBER	MAXIMUM RATE (cfm)	POLLUTANT EMITTED	POLLUTANT EF (gr/cfm)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hours/yr)	ANNUAL EMISSIONS (tpy)	COMMENTS
Storage Silo A Baghouse	CM-701A	SL-1	4,950	PM	0.01	USEPA Handbook	0.42	8,760	1.9	EPA/625/6-91/014: Control Technologies for HAPs
				PM <sub>10</sub>	0.01	USEPA Handbook	0.42	8,760	1.9	
				PM <sub>2.5</sub>	0.01	USEPA Handbook	0.42	8,760	1.9	
Storage Silo B Baghouse	CM-701B	SL-2	4,950	PM	0.01	USEPA Handbook	0.42	8,760	1.9	EPA/625/6-91/014: Control Technologies for HAPs
				PM <sub>10</sub>	0.01	USEPA Handbook	0.42	8,760	1.9	
				PM <sub>2.5</sub>	0.01	USEPA Handbook	0.42	8,760	1.9	
Storage Silo C Baghouse	CM-701C	SL-3	4,950	PM	0.01	USEPA Handbook	0.42	8,760	1.9	EPA/625/6-91/014: Control Technologies for HAPs
				PM <sub>10</sub>	0.01	USEPA Handbook	0.42	8,761	1.9	
				PM <sub>2.5</sub>	0.01	USEPA Handbook	0.42	8,762	1.9	
Storage Silo D Baghouse	CM-701D	SL-4	4,950	PM	0.01	USEPA Handbook	0.42	8,760	1.9	EPA/625/6-91/014: Control Technologies for HAPs
				PM <sub>10</sub>	0.01	USEPA Handbook	0.42	8,760	1.9	
				PM <sub>2.5</sub>	0.01	USEPA Handbook	0.42	8,760	1.9	
Storage Silo E Baghouse	CM-701E	SL-5	4,950	PM	0.01	USEPA Handbook	0.42	8,760	1.9	EPA/625/6-91/014: Control Technologies for HAPs
				PM <sub>10</sub>	0.01	USEPA Handbook	0.42	8,761	1.9	
				PM <sub>2.5</sub>	0.01	USEPA Handbook	0.42	8,762	1.9	
Storage Silo F Baghouse	CM-720 A/B	SL-6A/B		PM	-	Source Test	0.48	8,760	2.1	
				PM <sub>10</sub>	-	Source Test	0.48	8,760	2.1	
				PM <sub>2.5</sub>	-	Source Test	0.48	8,760	2.1	
Load Spout A Dust Collector	CM-705A	SL-7	1,200	PM	0.01	USEPA Handbook	0.10	8,760	0.5	EPA/625/6-91/014: Control Technologies for HAPs
				PM <sub>10</sub>	0.01	USEPA Handbook	0.10	8,760	0.5	
				PM <sub>2.5</sub>	0.01	USEPA Handbook	0.10	8,760	0.5	
Load Spout B Dust Collector	CM-705B	SL-8	1,200	PM	0.01	USEPA Handbook	0.10	8,760	0.5	EPA/625/6-91/014: Control Technologies for HAPs
				PM <sub>10</sub>	0.01	USEPA Handbook	0.10	8,760	0.5	
				PM <sub>2.5</sub>	0.01	USEPA Handbook	0.10	8,760	0.5	
Load Spout C Dust Collector	CM-705C	SL-9	1,200	PM	0.01	USEPA Handbook	0.10	8,760	0.5	EPA/625/6-91/014: Control Technologies for HAPs
				PM <sub>10</sub>	0.01	USEPA Handbook	0.10	8,760	0.5	
				PM <sub>2.5</sub>	0.01	USEPA Handbook	0.10	8,760	0.5	
Bulk Truck Loading Bag Filter	CM-722	SL-10		PM	-	BP Calcs	0.20	8,760	0.9	
				PM <sub>10</sub>	-	BP Calcs	0.20	8,760	0.9	
				PM <sub>2.5</sub>	-	BP Calcs	0.20	8,760	0.9	



Table B-27  
Shipping -Loading Controlled and Uncontrolled PTE Emissions

**Ship and Load - Uncontrolled**

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	STACK ID NUMBER	MAXIMUM RATE (cfm)	POLLUTANT EMITTED	POLLUTANT EF (gr/cfm)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hours/yr)	ANNUAL EMISSIONS (tpy)	COMMENTS
Storage Silo A Baghouse	CM-701A	SL-1	4,950	PM	1	USEPA Handbook	42.43	8,760	185.8	EPA/625/6-91/014: Control Technologies for HAPs
				PM <sub>10</sub>	1	USEPA Handbook	42.43	8,760	185.8	
				PM <sub>2.5</sub>	1	USEPA Handbook	42.43	8,760	185.8	
Storage Silo B Baghouse	CM-701B	SL-2	4,950	PM	1	USEPA Handbook	42.43	8,760	185.8	EPA/625/6-91/014: Control Technologies for HAPs
				PM <sub>10</sub>	1	USEPA Handbook	42.43	8,760	185.8	
				PM <sub>2.5</sub>	1	USEPA Handbook	42.43	8,760	185.8	
Storage Silo C Baghouse	CM-701C	SL-3	4,950	PM	1	USEPA Handbook	42.43	8,760	185.8	EPA/625/6-91/014: Control Technologies for HAPs
				PM <sub>10</sub>	1	USEPA Handbook	42.43	8,761	185.9	
				PM <sub>2.5</sub>	1	USEPA Handbook	42.43	8,762	185.9	
Storage Silo D Baghouse	CM-701D	SL-4	4,950	PM	1	USEPA Handbook	42.43	8,760	185.8	EPA/625/6-91/014: Control Technologies for HAPs
				PM <sub>10</sub>	1	USEPA Handbook	42.43	8,760	185.8	
				PM <sub>2.5</sub>	1	USEPA Handbook	42.43	8,760	185.8	
Storage Silo E Baghouse	CM-701E	SL-5	4,950	PM	1	USEPA Handbook	42.43	8,760	185.8	EPA/625/6-91/014: Control Technologies for HAPs
				PM <sub>10</sub>	1	USEPA Handbook	42.43	8,761	185.9	
				PM <sub>2.5</sub>	1	USEPA Handbook	42.43	8,762	185.9	
Storage Silo F Baghouse	CM-720 A/B	SL-6A/B		PM	-	Source Test	48.00	8,760	210.2	
				PM <sub>10</sub>	-	Source Test	48.00	8,760	210.2	
				PM <sub>2.5</sub>	-	Source Test	48.00	8,760	210.2	
Load Spout A Dust Collector	CM-705A	SL-7	1,200	PM	1	USEPA Handbook	10.29	8,760	45.1	EPA/625/6-91/014: Control Technologies for HAPs
				PM <sub>10</sub>	1	USEPA Handbook	10.29	8,760	45.1	
				PM <sub>2.5</sub>	1	USEPA Handbook	10.29	8,760	45.1	
Load Spout B Dust Collector	CM-705B	SL-8	1,200	PM	1	USEPA Handbook	10.29	8,760	45.1	EPA/625/6-91/014: Control Technologies for HAPs
				PM <sub>10</sub>	1	USEPA Handbook	10.29	8,760	45.1	
				PM <sub>2.5</sub>	1	USEPA Handbook	10.29	8,760	45.1	
Load Spout C Dust Collector	CM-705C	SL-9	1,200	PM	1	USEPA Handbook	10.29	8,760	45.1	EPA/625/6-91/014: Control Technologies for HAPs
				PM <sub>10</sub>	1	USEPA Handbook	10.29	8,760	45.1	
				PM <sub>2.5</sub>	1	USEPA Handbook	10.29	8,760	45.1	
Bulk Truck Loading Bag Filter	CM-722	SL-10		PM	-	BP Calcs	20.00	8,760	87.6	
				PM <sub>10</sub>	-	BP Calcs	20.00	8,760	87.6	
				PM <sub>2.5</sub>	-	BP Calcs	20.00	8,760	87.6	

Can only have flow to 4 of 6 silos at any one time.

TOTAL ANNUAL SHIPPING AND LOADING EMISSIONS - CONTROLLED				
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	FUGITIVE SOURCES (tpy)	TOTALS
NO <sub>x</sub>	0	NA	N/A	0
VOC	0	NA	N/A	0
CO	0	NA	N/A	0
SO <sub>2</sub>	0	NA	N/A	0
PM	13.6	NA	N/A	13.6
PM <sub>10</sub>	13.6	NA	N/A	13.6
PM <sub>2.5</sub>	13.6	NA	N/A	13.6
CO <sub>2</sub> e	NA	NA	N/A	0

TOTAL ANNUAL SHIPPING AND LOADING EMISSIONS - UNCONTROLLED				
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	FUGITIVE SOURCES (tpy)	TOTALS
NO <sub>x</sub>	0	NA	N/A	0
VOC	0	NA	N/A	0
CO	0	NA	N/A	0
SO <sub>2</sub>	0	NA	N/A	0
PM	1,362.2	NA	N/A	1,362.2
PM <sub>10</sub>	1,362.2	NA	N/A	1,362.2
PM <sub>2.5</sub>	1,362.3	NA	N/A	1,362.3
CO <sub>2</sub> e	NA	NA	N/A	0

Table B-28  
Utility Controlled and Uncontrolled PTE Emissions

Combustion Sources

				NATURAL GAS						DIESEL (Engines 0.05% Sulfur/Boilers at 0.5% Sulfur)							NATURAL GAS REST OF YEAR (Oil at 862 hr/yr [2,400,000 gal/yr each])					COMB	WORST-CASE ANNUAL EMISSION (tpy)	
EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	STACK ID NUMBER	MAXIMUM RATE	POLLUTANT	EF (lb/MMBtu)	EMISSION FACTOR REFERENCE	HOURLY EMISSION (lb/hr)	OPERATE (hrs/yr)	ANNUAL EMISSION (tpy)	POLLUTANT	OIL EMISSION FACTOR	UNITS	EMISSION FACTOR REFERENCE	HOURLY EMISSION (lb/hr)	OPERATION (hrs/yr)	ANNUAL EMISSION (tpy) - Oil	POLLUTANT EMITTED	NG EMISSION FACTOR (lb/MMBtu)	HOURLY EMISSIONS (lb/hr)	OPERATION (hrs/yr)	ANNUAL EMISSIONS (tpy) - NG	OIL AND NG ANNUAL EMISSIONS (tpy)		
Boiler #3	AB-350A	U-11	390  MMBtu*	NO <sub>x</sub>	0.0800	Vendor Data	31.20	8,760	136.7	NO <sub>x</sub>	0.10	lb/MMBtu	Vendor Data	39.00	862	16.8	NO <sub>x</sub>	0.0800	31.20	7,898	123.2	140.0	140.0	Gas Boiler which only burns oil in gas curtailment. Oil is limited to less than 10% of capacity.
				VOC	0.0054	AP-42 1.4 (7/98)	2.10	8,760	9.2	VOC	0.20	lb/1000 gal	AP-42 1.3 (5/10)	0.56	862	0.2	VOC	0.0054	2.10	7,898	8.3	8.5	9.2	
				CO	0.0824	AP-42 1.4 (7/98)	32.12	8,760	140.7	CO	5.00	lb/1000 gal	AP-42 1.3 (5/10)	13.93	862	6.0	CO	0.0824	32.12	7,898	126.8	132.8	140.7	
				SO <sub>2</sub>	0.0006	AP-42 1.4 (7/98)	0.23	8,760	1.0	SO <sub>2</sub>	0.51	lb/MMBtu	Mass Balance	199.28	862	85.8	SO <sub>2</sub>	0.0006	0.23	7,898	0.9	86.8	86.8	
				PM	0.0050	Vendor Data	1.95	8,760	8.5	PM	0.03	lb/MMBtu	Vendor Data	11.70	862	5.0	PM	0.0050	1.95	7,898	7.7	12.7	12.7	
				PM <sub>10</sub>	0.0050	Vendor Data	1.95	8,760	8.5	PM <sub>10</sub>	0.02	lb/MMBtu	Vendor Data	8.15	862	3.5	PM <sub>10</sub>	0.0050	1.95	7,898	7.7	11.2	11.2	
				PM <sub>2.5</sub>	0.0050	Vendor Data	1.95	8,760	8.5	PM <sub>2.5</sub>	0.01	lb/MMBtu	Vendor Data	5.46	862	2.4	PM <sub>2.5</sub>	0.0050	1.95	7,898	7.7	10.1	10.1	
				CO <sub>2</sub> e	117.0	USEPA Factor	45,630.0	8,760	199,859.4	CO <sub>2</sub> e	163.6	lb/MMBtu	Vendor Data	63,804.0	862	27,484.8	CO <sub>2</sub> e	117.0	45,630.0	7,898	180,203.4	207,688.2	207,688.2	
Boiler #4	AB-350B	U-12	390  MMBtu*	NO <sub>x</sub>	0.0800	Vendor Data	31.20	8,760	136.7	NO <sub>x</sub>	0.1	lb/MMBtu	Vendor Data	39.00	862	16.8	NO <sub>x</sub>	0.0800	31.20	7,898	123.2	140.0	140.0	Gas Boiler which only burns oil in gas curtailment. Oil is limited to less than 10% of capacity.
				VOC	0.0054	AP-42 1.4 (7/98)	2.10	8,760	9.2	VOC	0.76	lb/M gal	AP-42 1.3 (9/98)	2.12	862	0.9	VOC	0.0054	2.10	7,898	8.3	9.2	9.2	
				CO	0.0824	AP-42 1.4 (7/98)	32.12	8,760	140.7	CO	5.00	lb/M gal	AP-42 1.3 (9/98)	13.93	862	6.0	CO	0.0824	32.12	7,898	126.8	132.8	140.7	
				SO <sub>2</sub>	0.0006	AP-42 1.4 (7/98)	0.23	8,760	1.0	SO <sub>2</sub>	0.51	lb/MMBtu	Mass Balance	199.28	862	85.8	SO <sub>2</sub>	0.0006	0.23	7,898	0.9	86.8	86.8	
				PM	0.0050	Vendor Data	1.95	8,760	8.5	PM	0.03	lb/MMBtu	Vendor Data	11.70	862	5.0	PM	0.0050	1.95	7,898	7.7	12.7	12.7	
				PM <sub>10</sub>	0.0050	Vendor Data	1.95	8,760	8.5	PM <sub>10</sub>	0.02	lb/MMBtu	Vendor Data	8.15	862	3.5	PM <sub>10</sub>	0.0050	1.95	7,898	7.7	11.2	11.2	
				PM <sub>2.5</sub>	0.0050	Vendor Data	1.95	8,760	8.5	PM <sub>2.5</sub>	0.01	lb/MMBtu	Vendor Data	5.46	862	2.4	PM <sub>2.5</sub>	0.0050	1.95	7,898	7.7	10.1	10.1	
				CO <sub>2</sub> e	117.0	USEPA Factor	45,630.0	8,760	199,859.4	CO <sub>2</sub> e	163.6	lb/MMBtu	Vendor Data	63,804.0	862	27,484.8	CO <sub>2</sub> e	117.0	45,630.0	7,898	180,203.4	207,688.2	207,688.2	
Emergency Generator #1	AM-804	U-3	368.8  BHP							NO <sub>x</sub>	0.031	lb/hp-hr	AP-42 3.3 (10/96)	11.43	100	0.6						0.6	275 KW Generator Hours limit set by MACT	
										VOC	0.00251	lb/hp-hr	AP-42 3.3 (10/96)	0.93	100	0.05						0.05		
										CO	0.00668	lb/hp-hr	AP-42 3.3 (10/96)	2.46	100	0.1						0.12		
										SO <sub>2</sub>	0.00205	lb/hp-hr	AP-42 3.3 (10/96)	0.76	100	0.04						0.04		
										PM	0.00220	lb/hp-hr	AP-42 3.3 (10/96)	0.81	100	0.04						0.04		
										PM <sub>10</sub>	0.00220	lb/hp-hr	AP-42 3.3 (10/96)	0.81	100	0.04						0.04		
										PM <sub>2.5</sub>	0.00220	lb/hp-hr	AP-42 3.3 (10/96)	0.81	100	0.04						0.04		
CO <sub>2</sub> e	1.1500	lb/hp-hr	AP-42 3.3 (10/96)	424.09	100	21.2	21.2																	
Compressor #1	AC-402	U-4	413  BHP							NO <sub>x</sub>	0.031	lb/hp-hr	AP-42 3.3 (10/96)	12.80	100	0.6						0.6	Hours limited by MACT regulation	
										VOC	0.00251	lb/hp-hr	AP-42 3.3 (10/96)	1.04	100	0.1						0.1		
										CO	0.00668	lb/hp-hr	AP-42 3.3 (10/96)	2.76	100	0.1						0.1		
										SO <sub>2</sub>	0.00205	lb/hp-hr	AP-42 3.3 (10/96)	0.85	100	0.04						0.04		
										PM	0.00220	lb/hp-hr	AP-42 3.3 (10/96)	0.91	100	0.05						0.05		
										PM <sub>10</sub>	0.00220	lb/hp-hr	AP-42 3.3 (10/96)	0.91	100	0.05						0.05		
										PM <sub>2.5</sub>	0.00220	lb/hp-hr	AP-42 3.3 (10/96)	0.91	100	0.05						0.05		
CO <sub>2</sub> e	1.1500	lb/hp-hr	AP-42 3.3 (10/96)	474.95	100	23.7	23.7																	
Emergency FW Pump	AG-202B	U-5	285  BHP							NO <sub>x</sub>	0.012	lb/hp-hr	Vendor Data Submitted in 502B10 application March 2004	3.37	100	0.2						0.2	Pump replaced in 2004. Hours limited by MACT regulation	
										VOC	0.001	lb/hp-hr		0.15	100	0.01						0.01		
										CO	0.002	lb/hp-hr		0.48	100	0.02						0.02		
										SO <sub>2</sub>	0.0004	lb/hp-hr		0.12	100	0.01						0.01		
										PM	0.0003	lb/hp-hr		0.09	100	0.004						0.004		
										PM <sub>10</sub>	0.0003	lb/hp-hr		0.09	100	0.004						0.004		
										PM <sub>2.5</sub>	0.0003	lb/hp-hr		0.09	100	0.004						0.004		
CO <sub>2</sub> e	1.1500	lb/hp-hr	AP-42 3.3 (10/96)	327.75	100	16.4	16.4																	
Compressor #2	AC-404	U-6	1200  BHP							NO <sub>x</sub>	0.024	lb/hp-hr	Permit Limit	28.53	500	7.1						7.1	Hours limited by permit.	
										VOC	0.001	lb/hp-hr		1.20	500	0.3						0.3		
										CO	0.001	lb/hp-hr		1.30	500	0.3						0.3		
										SO <sub>2</sub>	0.002	lb/hp-hr		2.33	500	0.6						0.6		
										PM	0.0003	lb/hp-hr		0.35	500	0.1						0.1		
										PM <sub>10</sub>	0.0003	lb/hp-hr		0.35	500	0.1						0.1		
										PM <sub>2.5</sub>	0.0003	lb/hp-hr		0.35	500	0.1						0.1		
CO <sub>2</sub> e	1.16	lb/hp-hr	AP-42 3.4 (10/96)	1,392.0	500	348.0	348.0																	
T-Head FW Pump	AG-229	U-7	224  BHP							NO <sub>x</sub>	0.0057	lb/hp-hr	Vendor Data	1.28	100	0.1						0.1	Hours limited by MACT regulation	
										VOC	0.00022	lb/hp-hr		0.05	100	0.002						0.002		
										CO	0.00132	lb/hp-hr		0.30	100	0.01						0.015		
										SO <sub>2</sub>	0.00041	lb/hp-hr		0.09	100	0.005						0.005		
										PM	0.00018	lb/hp-hr		0.04	100	0.002						0.002		
										PM <sub>10</sub>	0.00018	lb/hp-hr		0.04	100	0.002						0.002		
										PM <sub>2.5</sub>	0.00018	lb/hp-hr		0.04	100	0.002						0.002		
CO <sub>2</sub> e	1.1500	lb/hp-hr	AP-42 3.3 (10/96)	257.60	100	12.9	12.9																	

Table B-28  
Utility Controlled and Uncontrolled PTE Emissions

				NATURAL GAS						DIESEL (Engines 0.05% Sulfur/Boilers at 0.5% Sulfur)							NATURAL GAS REST OF YEAR (Oil at 862 hr/yr [2,400,000 gal/yr each])					COMB		
EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	STACK ID NUMBER	MAXIMUM RATE	POLLUTANT	EF (lb/MMBtu)	EMISSION FACTOR REFERENCE	HOURLY EMISSION (lb/hr)	OPERATE (hrs/yr)	ANNUAL EMISSION (tpy)	POLLUTANT	OIL EMISSION FACTOR	UNITS	EMISSION FACTOR REFERENCE	HOURLY EMISSION (lb/hr)	OPERATION (hrs/yr)	ANNUAL EMISSION (tpy) -Oil	POLLUTANT EMITTED	NG EMISSION FACTOR (lb/MMBtu)	HOURLY EMISSIONS (lb/hr)	OPERATION (hrs/yr)	ANNUAL EMISSIONS (tpy) - NG	OIL AND NG ANNUAL EMISSIONS (tpy)	WORST-CASE ANNUAL EMISSION (tpy)	COMMENTS
IT Emergency Generator	AM-838	U-8	670.5							NO <sub>x</sub>	0.107	lb/hp-hr	Vendor Data Submitted in application December 2001	14.57	500	3.6							3.6	500 KW Generator Hours limited by permit
			VOC							0.00044	lb/hp-hr	0.06		500	0.02	0.02								
			CO							0.00402	lb/hp-hr	0.55		500	0.1	0.1								
			SO <sub>2</sub>							0.01171	lb/hp-hr	1.60		500	0.4	0.4								
			PM							0.00498	lb/hp-hr	0.68		500	0.2	0.2								
			PM <sub>10</sub>							0.00498	lb/hp-hr	0.68		500	0.2	0.2								
			PM <sub>2.5</sub>							0.00498	lb/hp-hr	0.68		500	0.2	0.2								
			CO <sub>2</sub> e							1.1613	lb/hp-hr	AP-42 3.4 (10/96)		158.7	500	39.7							39.7	
Emergency FW Pump	AG-202C	U-9	669							NO <sub>x</sub>	0.022	lb/hp-hr	Vendor Data Submitted in application June 2003	14.65	250	1.8							1.8	New pump installed in 2004. Hours limited by permit.
			VOC							0.000	lb/hp-hr	0.22		250	0.03	0.03								
			CO							0.004	lb/hp-hr	2.94		250	0.4	0.4								
			SO <sub>2</sub>							0.007	lb/hp-hr	4.72		250	0.6	0.6								
			PM							0.0004	lb/hp-hr	0.27		250	0.03	0.03								
			PM <sub>10</sub>							0.0004	lb/hp-hr	0.27		250	0.03	0.03								
			PM <sub>2.5</sub>							0.0004	lb/hp-hr	0.27		250	0.03	0.03								
			CO <sub>2</sub> e							1.16	lb/hp-hr	AP-42 3.4 (10/96)		776.0	250	97.0							97.0	
Emergency FW Pump	AG-202D	U-10	669							NO <sub>x</sub>	0.022	lb/hp-hr	Vendor Data Submitted in application June 2003	14.65	250	1.8							1.8	New pump installed in 2004. Hours limited by permit.
			VOC							0.000	lb/hp-hr	0.22		250	0.03	0.03								
			CO							0.004	lb/hp-hr	2.94		250	0.4	0.4								
			SO <sub>2</sub>							0.007	lb/hp-hr	4.72		250	0.6	0.6								
			PM							0.0004	lb/hp-hr	0.27		250	0.03	0.03								
			PM <sub>10</sub>							0.0004	lb/hp-hr	0.27		250	0.03	0.03								
			PM <sub>2.5</sub>							0.0004	lb/hp-hr	0.27		250	0.03	0.03								
			CO <sub>2</sub> e							1.16	lb/hp-hr	AP-42 3.4 (10/96)		776.0	250	97.0							97.0	
Compressor L-1	L-1	U-13	2.99 MMBtu/hr							NO <sub>x</sub>		-	Permit Limit	3.50	4,380	7.7							7.7	Total combined capacity of compressors L-1 & 2 shall be less than 2350 HP (5.98 Million Btu/hr)
			1175 BHP							VOC		-		0.53	4,380	1.16							1.2	
			CO								-	0.75		4,380	1.64	1.6								
			SO <sub>2</sub>								-	3.00		4,380	6.57	6.6								
			PM								-	1.80		4,380	3.94	3.9								
			PM <sub>10</sub>								-	1.80		4,380	3.94	3.9								
			PM <sub>2.5</sub>								-	1.80		4,380	3.94	3.9								
			CO <sub>2</sub> e							163.6	lb/MMBtu	USEPA Factor		489.16	4,380	1071.3							1071.3	
Compressor L-2	L-2	U-14	2.99 MMBtu/hr							NO <sub>x</sub>		-	Permit Limit	3.50	4,380	7.7							7.7	Total combined capacity of compressors L-1 & 2 shall be less than 2350 HP (5.98 Million Btu/hr)
			1175 BHP							VOC		-		0.53	4,380	1.16							1.2	
			CO								-	0.75		4,380	1.64	1.6								
			SO <sub>2</sub>								-	3.00		4,380	6.57	6.6								
			PM								-	1.80		4,380	3.94	3.9								
			PM <sub>10</sub>								-	1.80		4,380	3.94	3.9								
			PM <sub>2.5</sub>								-	1.80		4,380	3.94	3.9								
			CO <sub>2</sub> e							163.6	lb/MMBtu	USEPA Factor		489.16	4,380	1071.3							1071.3	

\* Maximum shown for the boilers is the nominal boiler fire rate.

TOTAL ANNUAL UTILITY EMISSIONS - CONTROLLED				
POLLUTANT	PROCESS SOURCES (lb/hr)	COMBUSTION SOURCES (lb/hr)	FUGITIVE SOURCES (lb/hr)	TOTALS
NO <sub>x</sub>	N/A	311.2	N/A	311.2
VOC	N/A	21.2	N/A	21.2
CO	N/A	286.1	N/A	286.1
SO <sub>2</sub>	N/A	188.9	N/A	188.9
PM	N/A	33.8	N/A	33.8
PM <sub>10</sub>	N/A	30.7	N/A	30.7
PM <sub>2.5</sub>	N/A	28.4	N/A	28.4
CO <sub>2</sub> e	N/A	418,174.8	N/A	418,174.8

TOTAL ANNUAL UTILITY EMISSIONS - UNCONTROLLED				
POLLUTANT	PROCESS SOURCES (lb/hr)	COMBUSTION SOURCES (lb/hr)	FUGITIVE SOURCES (lb/hr)	TOTALS
NO <sub>x</sub>	N/A	311.2	N/A	311.2
VOC	N/A	21.2	N/A	21.2
CO	N/A	286.1	N/A	286.1
SO <sub>2</sub>	N/A	188.9	N/A	188.9
PM	N/A	33.8	N/A	33.8
PM <sub>10</sub>	N/A	30.7	N/A	30.7
PM <sub>2.5</sub>	N/A	28.4	N/A	28.4
CO <sub>2</sub> e	N/A	418,174.8	N/A	418,174.8

Table B-29  
WWT Controlled and Uncontrolled PTE Emissions

**WWT-Controlled**

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	STACK ID NUMBER	MAXIMUM RATE	POLLUTANT(S) EMITTED	POLLUTANT EMISSION FACTOR	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hours/yr)	ANNUAL EMISSIONS (tpy)	COMMENTS
CO <sub>2</sub> Stripper	AT-750	WT-10		VOC	-	BP Calcs	0.35	8,760	1.5	
Anaerobic Reactor / UASB	AM-775 / AR-751	WT-11**		VOC	-	BP Calcs	0.31	8,760	1.4	
WWTP Fugitives				VOC		USEPA Water 9.0	15	8,760	65.7	

\*\* Flow normally zero.

**WWT-Uncontrolled**

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	STACK ID NUMBER	MAXIMUM RATE	POLLUTANT(S) EMITTED	POLLUTANT EMISSION FACTOR	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hours/yr)	ANNUAL EMISSIONS (tpy)	COMMENTS
CO <sub>2</sub> Stripper	AT-750	WT-10		VOC	-	BP Calcs	0.35	8,760	1.5	
Anaerobic Reactor / UASB	AM-775 / AR-751	WT-11**		VOC	-	BP Calcs	0.31	8,760	1.4	
WWTP Fugitives				VOC		USEPA Water 9.0	15	8,760	65.7	

\*\* Flow normally zero.

TOTAL ANNUAL WASTEWATER TREATMENT EMISSIONS - CONTROLLED				
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	FUGITIVE SOURCES (tpy)	TOTALS
NO <sub>x</sub>	0	0	NA	0
VOC	2.89	0.0	65.70	68.59
CO	0	0	NA	0
SO <sub>2</sub>	0	0	NA	0
PM	0	0	NA	0
PM <sub>10</sub>	0	0	NA	0
PM <sub>2.5</sub>	0	0	NA	0
CO <sub>2</sub> e	0	0	NA	0

TOTAL ANNUAL WASTEWATER TREATMENT EMISSIONS - UNCONTROLLED				
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	FUGITIVE SOURCES (tpy)	TOTALS
NO <sub>x</sub>	0	0	NA	0
VOC	2.89	0.0	65.70	68.59
CO	0	0	NA	0
SO <sub>2</sub>	0	0	NA	0
PM	0	0	NA	0
PM <sub>10</sub>	0	0	NA	0
PM <sub>2.5</sub>	0	0	NA	0
CO <sub>2</sub> e	0	0	NA	0

## Hazardous Air Pollutants Emissions

Table B-30  
Hazardous Air Pollutants Emissions

#1 OX	EMISSION EQUIPMENT DESCRIPTION	EQUIP ID NUMBER	STACK ID NUMBER	POLLUTANT(S) EMITTED	HOURLY EMISSIONS (lb/hr)	ANNUAL EMISSIONS (tpy)
	HPVGTS	HPVGTS-1	O-2/O-10/O-15	Acetaldehyde	0.004	0.02
				Benzene	1.21	5.3
				Formaldehyde	0.003	0.013
				Methanol	0.87	3.8
				Methyl Bromide	2.03	8.9
				Paraxylene	0.04	0.2
	Toluene	0.04	0.2			
Atmospheric Absorber	BT-603	O-3	Benzene	1.47	6.7	
			Formaldehyde	0.01	0.03	
			Methanol	0.58	2.7	
			Methyl Bromide	1.75	8.0	
			Paraxylene	0.88	4.0	
			Toluene	0.18	0.8	
Equipment Fugitives			Paraxylene	5.00	21.7	

#1 OX	POLLUTANT	lb/hr	tpy
	Acetaldehyde	0.004	0.015
	Benzene	2.68	12.0
	Formaldehyde	0.01	0.04
	Methanol	1.45	6.5
	Methyl Bromide	3.78	16.9
	Paraxylene	5.92	25.9
	Toluene	0.22	1.0
Total HAPS	14.08	62.4	

#1 PTA	EMISSION EQUIPMENT DESCRIPTION	EQUIP ID NUMBER	STACK ID NUMBER	POLLUTANT(S) EMITTED	HOURLY EMISSIONS (lb/hr)	ANNUAL EMISSIONS (tpy)
	Crystallizer Vent Scrubber	CM-301	P-2	Acetaldehyde	0.12	0.5
				Benzene	0.01	0.03
				Formaldehyde	0.10	0.5
				Methanol	0.23	1.0
				Methyl Bronide	0	0
				Paraxylene	0.28	1.2
				Toluene	0.08	0.4
Total	0.82	3.6				

Table B-30  
Hazardous Air Pollutants Emissions

	EMISSION EQUIPMENT DESCRIPTION	EQUIP ID NUMBER	STACK ID NUMBER	POLLUTANT(S) EMITTED	HOURLY EMISSIONS (lb/hr)	ANNUAL EMISSIONS (tpy)
#2 OX	HPVGTS	HPVGTS-2	O2-3/4	Acetaldehyde	0.24	1.1
				Benzene	0.25	1.1
				Formaldehyde	0.46	2.0
				Methanol	0.97	4.2
				Methyl Bromide	0.22	0.9
				Paraxylene	0.75	3.3
				Toluene	0.18	0.8
	Atmospheric Absorber	DT-302	O2-1	Benzene	1.42	6.2
				Formaldehyde	0.01	0.02
				Methanol	0.56	2.5
				Methyl Bromide	1.68	7.4
				Paraxylene	0.85	3.7
				Toluene	0.17	0.8
	Equipment Fugitives			Paraxylene	5.06	22.2

POLLUTANT	lb/hr	tpy
Acetaldehyde	0.24	1.1
Benzene	1.67	7.3
Formaldehyde	0.47	2.1
Methanol	1.53	6.7
Methyl Bromide	1.90	8.3
Paraxylene	6.65	29.2
Toluene	0.35	1.5
<b>Total HAPS</b>	<b>12.81</b>	<b>56.2</b>

	EMISSION EQUIPMENT DESCRIPTION	EQUIP ID NUMBER	STACK ID NUMBER	POLLUTANT(S) EMITTED	HOURLY EMISSIONS (lb/hr)	ANNUAL EMISSIONS (tpy)
#2 PTA	Crystallizer Vent Scrubber	DM-601	P2-2	Acetaldehyde	0.21	0.9
				Benzene	0.01	0.05
				Formaldehyde	0.19	0.8
				Methanol	0.41	1.8
				Methyl Bromide	0	0
				Paraxylene	0.51	2.2
				Toluene	0.14	0.6
				<b>Total</b>	<b>1.47</b>	<b>6.5</b>

**Facility-Wide**

POLLUTANT	lb/hr	tpy
Acetaldehyde	0.6	2.5
Benzene	4.4	19.4
Formaldehyde	0.8	3.4
Methanol	3.6	16.0
Methyl Bromide	5.7	25.2
Paraxylene	13.4	58.5
Toluene	0.8	3.5
<b>Total HAPS</b>	<b>29.2</b>	<b>128.6</b>

**Table B-31**  
**Cooling Tower PM Fractions and Emissions**

**Input Data**

TDS	1500 ppmw	Annual Hours	8,760 hr/yr
Density of Water	0.000001 µg/µm <sup>3</sup>	Conversion	60 min/hr
Density of particles	2.20E-06 µg/µm <sup>3</sup>	Conversion	2,000 lb/ton
Recirculation Rate	97000 gpm		
Drift %	0.0006 %		
Density of Water	8.34 lb/gal		

**Table 1 Results<sup>(1)</sup>**

EPRI DROPLET DIAMETER (µm)	DROPLET VOLUME (µm <sup>3</sup> )	DROPLET MASS (µg)	PARTICLE MASS (Solids) (µg)	SOLID PARTICLE VOLUME (µm <sup>3</sup> )	SOLID PARTICLE DIAMETER (µm)	EPRI % MASS SMALLER
10	523.60	5.24E-04	7.85E-07	0.36	0.88	0.0000
20	4,188.79	4.19E-03	6.28E-06	2.86	1.76	0.196
30	14,137.17	1.41E-02	2.12E-05	9.64	2.64	0.226
40	33,510.32	3.35E-02	5.03E-05	22.85	3.52	0.514
50	65,449.85	6.54E-02	9.82E-05	44.62	4.40	1.816
60	113,097.34	1.13E-01	1.70E-04	77.11	5.28	5.702
70	179,594.38	1.80E-01	2.69E-04	122.45	6.16	21.348
90	381,703.51	3.82E-01	5.73E-04	260.25	7.92	49.812
110	696,909.97	6.97E-01	1.05E-03	475.17	9.68	70.509
130	1,150,346.51	1.15E+00	1.73E-03	784.33	11.44	82.023
150	1,767,145.87	1.77E+00	2.65E-03	1,204.87	13.20	88.012
180	3,053,628.06	3.05E+00	4.58E-03	2,082.02	15.84	91.032
210	4,849,048.26	4.85E+00	7.27E-03	3,306.17	18.48	92.468
240	7,238,229.47	7.24E+00	1.09E-02	4,935.16	21.12	94.091
270	10,305,994.70	1.03E+01	1.55E-02	7,026.81	23.76	94.689
300	14,137,166.94	1.41E+01	2.12E-02	9,638.98	26.40	96.288
350	22,449,297.50	2.24E+01	3.37E-02	15,306.34	30.81	97.011
400	33,510,321.64	3.35E+01	5.03E-02	22,847.95	35.21	98.340
450	47,712,938.43	4.77E+01	7.16E-02	32,531.55	39.61	99.071
500	65,449,846.95	6.54E+01	9.82E-02	44,624.90	44.01	99.071
600	113,097,335.53	1.13E+02	1.70E-01	77,111.82	52.81	100.000

<sup>(1)</sup> Based on "Calculating Realistic PM10 Emissions from Cooling Towers" by Reisman & Frisbie at Greystone Environmental Consultants

PM MASS FRACTIONS		LINEAR INTERPOLATION VALUES			
PM SIZE	MASS FRACTION	SOLID PARTICLE DIAMETER		MASS FRACTION	
		T1	T2	R1	R2
10	72.591	9.682	11.442	70.509	82.023
2.5	0.221	1.760	2.640	0.196	0.226

**Cooling Tower Emission Rates**

EMISSIONS	lb/hr	tpy
Total PM	0.44	1.91
PM <sub>10</sub>	0.32	1.39
PM <sub>2.5</sub>	0.001	0.004



# Appendix C

## RBLC Search Results

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RBLC Search Results  
VOC Emissions (Process Types 64.000, 64.003 and 64.999)

VOC	RBLC ID	PROCESS	VOC EMISSIONS LIMIT	CONTROL METHOD
64.000	TX-0624	Olefins Cracking Unit	801 tpy	IFR tanks and LDAR program
64.003	IA-0084	Main Fermenters	40 ppmvd	None
		Seed Fermenters	40 ppmvd	None
		Broth Tanks	0.02 lb/hr	None
		Solvent Recovery System	3.784 lb/hr	Scrubber
64.003	NE-0037	Stillage Evaporator	0.03 lb/hr	Wet Scrubber
		Steephouse	1.18 lb/hr	95% Eff. Thermal Oxidizer
		Fermentation	19.2 lb/hr	Wet scrubber
		Distillation Column	3.62 lb/hr	Wet scrubber
64.003	TX-0481	Process Steam Vent	0.01 lb/hr	None
		MSS Process Steam vent	0.01 lb/hr	None
64.003	OH-0284	Phenol II Process	208.43 lb/d	Condenser/TO/RTO
		Primary Cumene Stripper	3.59 lb/d	Condenser
		RTO for Cumene Oxid and Phenol II	6.17 lb/h	RTO
		Distillation of Alphamethylstyrene	75.16 lb/d	Condensers
		Cumene Oxidation Process	47.6 lb/d	Condenser/TO/RTO
		TO for Cumene Oxid and Phenol II	6.11 lb/hr	TO
64.003	NC-0111	Rotocel Operation Process Vents	10.8 lb/hr	Chilled Water Condenser/Scrubber
		Recovery Operation ARCON tank	8.76 lb/hr	Chilled Water Condenser
		Recovery Operation Stripper/Receiver	4.89 lb/hr	None
		Recovery Operation Stripper/Receiver	0.85 lb/hr	Chilled Water Condenser/Scrubber
		Botanical Extraction Process Vents	14.1 lb/hr	Chilled Water and liquid N2 Condensers
		Recovery Operation ARCON tank	0.80 lb/hr	Chilled Water Condenser/Scrubber
64.003	TX-0449	Analyzer Vents	0.22 lb/hr	None
64.003	WI-0207	Distillation P24-P29	127 lb/MM gal	Packed Scrubber Tower
		Distillation P46-P51	218 lb/MM gal	Packed Scrubber Tower
64.003	TX-0465	Glycol Vent	9.42 lb/hr	None
64.999	IN-0129	Rail TC Cleaning	98% Efficiency	Flare
64.999	NE-0042	Lactic Acid Production	5.53 lb/hr	98% Eff. RTO
		Fermentation	15.4 TPY	RTO
64.999	TX-0354	Incinerator Process Fugitives	0.01 lb/hr	LDAR Program
		Rundown Tank Fugitives	0.11 lb/hr	LDAR Program
		Incinerator	1.69 lb/hr	None
		Product Recovery Twr Fugitives	0.02 lb/hr	LDAR Program
		Acrolein Unit Column/Filter Cleaning	0.01 lb/hr	None

RBLC Search Results  
VOC Emissions (Process Type: Equipment Leaks)

PROCESS CODE	RBLC ID	PROCESS	VOC EMISSIONS LIMIT	CONTROL METHOD
64.002	FL-0322	Equipment Leaks	6.52 tpy	LDAR Vva program
	TX-0575	Equipment Leaks	9.01 tpy	TX LAER LDAR program
	IA-0084	Equipment Leaks	60.9 tpy	LDAR program
	NC-0111	Recovery Equipment Leaks	----	LDAR program
		Botanical Equipment Leaks	----	LDAR program
		Rotocel Equipment Leaks	----	LDAR program
	TX-0449	Cycle Compressor Oil Vent	0.11 lb/hr	None
		Area Fugitives	4.99 lb/hr	----
	TX-0454	Fugitives	0.13 lb/hr	None
	TX-0453	Fugitives	0.20 lb/hr	None
	WI-0204	Fugitives	SOCMI	SOCMI LDAR
	TX-0457	Fugitives	0.07 lb/hr	None
	TX-0465	Fugitives	9.33 lb/hr	None
		Fugitives 4	9.08 lb/hr	None
	TX-0354	DD Area Fugitives	0.06 lb/hr	LDAR program
		Train 2 Fugitives	0.08 lb/hr	LDAR program
		MMP Area Fugitives	0.13 lb/hr	LDAR program
		Acrolein Area Fugitives	0.07 lb/hr	LDAR program
		H2S Plant Fugitives	0.01 lb/hr	LDAR program
		Train 1 Fugitives	0.05 lb/hr	LDAR program
		Dimethyl Sulfide Fugitives	0.02 lb/hr	LDAR program
		Train 1 ETSH Fugitives	0.30 lb/hr	LDAR program
	TX-0422	Equipment Leaks	----	LDAR program

RBLC Search Results  
CO Emissions (Process Types 64.000, 64.003, and 64.999)

CO	RBLC ID	PROCESS	VOC EMISSIONS LIMIT	CONTROL METHOD
64.000	TX-0624	Olefins Cracking	2256 tpy	Good Engr and Combustion
64.003	ID-0017	Selexol Vent	8.7 lb/hr	Catox
	TX-0481	Rectisol Vent	11.4 lb/hr	None
		MSS Vent	21.6 lb/hr	None
	OH-0284	RTO Emissions	7.56 lb/hr	None
		TO Emissions	8.24 lb/hr	None
	TX-0354	TO Emissions-Steady state	9.56 lb/hr	None
64.999	TX-0609	Olefins Unit	146.43 tpy	Proper excess air and steam flow
	TX-0354	Incinerator	1.39 lb/hr	None

# Appendix D

## BACT Analysis Cost Information

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BP Cooper River  
COMMON COST VALUES FOR BACT ANALYSIS

COST DESCRIPTION	COST	BASIS FOR COST
Operations and Maintenance Labor	45 \$/hr	BP CR With Benefits
Natural Gas Cost	3.44 \$/1,000 cf	BP CR
Electricity Cost	0.058 \$/kW-hr	BP CR
Potable Water	2.67 \$/1,000 gal	BP CR
Steam	5.80 \$/1000 lb	BP CR
Nitrogen	1.625 \$/1000 SCF	BP CR
Wastewater Treatment	3.30 \$/1,000 gal	BP CR
Solid Waste Disposal	104.0 \$/ton	BP CR
Liquid Waste Disposal	0.15 \$/lb	BP CR
Caustic	0.31 \$/lb	BP CR
Carbon	1.00 \$/lb	Vendor Quotes for BP facility
Capital Recovery Factor (8% and 20 year life)	0.10185	USEPA Financial References
Site Preparation	150,000	
Facilities and Buildings	25,000	

# LPA VOC COST TABLES

## LPA THERMAL OXIDIZER

BASIS: Vendor Quotations, OAQPS Cost Manual (Sixth Edition)

COST ITEM	COST	TOTALS
<b>Direct Costs</b>		
<b>Purchased Equipment Costs: One 2,500 acfm TO Unit</b>		
Thermal Oxidizer (Input Cost: Vendor Info and QAQPS USEPA Factor)	\$380,000	N/A
Ancillary Equipment	\$57,000	
Blower	\$30,000	
Ancillary Equipment	\$4,500	
	<b>Sum = "A" =</b>	<b>\$471,500</b>
Instrumentation (0.10 * A)	\$47,150	
Sales Taxes (0.03 * A)	\$14,145	
Freight (0.05 * A)	\$23,575	
	<b>Purchased Equipment Cost = "B" =</b>	<b>\$556,370</b>
<b>Direct Installation Costs</b>		
Foundation and Supports (0.08 * B)	\$44,510	
Handling and Erection (0.14 * B)	\$77,892	
Electrical (0.04 * B)	\$22,255	
Piping, Ductwork, and Installation (0.02 * B)	\$11,127	
Insulation for Ductwork (0.01 * B)	\$5,564	
Painting (0.01 * B)	\$5,564	
	<b>Direct Installation Cost =</b>	<b>\$166,911</b>
Site Preparation (User Inputs Actual Cost)	\$150,000	
Facilities and Buildings (User Inputs Actual Cost)	\$25,000	
	<b>Total Direct Cost =</b>	<b>\$898,281</b>
<b>Indirect Cost (Installation)</b>		
Engineering (0.10 * B)	\$55,637	
Construction and Field Expenses (0.05 * B)	\$27,819	
Contractor Fees (0.10 * B)	\$55,637	
Start-Up (0.02 * B)	\$11,127	
Performance Test (0.01 * B)	\$5,564	
Contingencies (0.03 * B)	\$16,691	
	<b>Total Indirect Cost =</b>	<b>\$172,475</b>
<b>TOTAL CAPITAL INVESTMENT =</b>		<b>\$1,070,756</b>
<b>Direct Annual Costs (DC)</b>		
<b>Operating Labor</b>		
	<b>(Basis of Calculations)</b>	
Operator	= (hr/shift * shifts/day * days/yr * \$/hr)	0.5
Supervisor	= (15% of Operator Cost)	
Operating Materials	(If Any)	
Maintenance Labor	= (hr/shift * shifts/day * days/yr * \$/hr)	0.5
Maintenance Materials	= 100% of Maintenance Labor	
Replacement Labor	N/A	
Parts Cost	N/A	
<b>Utilities:</b>		
Fuel (natural gas)	(cfm/1000 * \$/1000 cf * 60 min/hr * 8760 hr/yr)	129.3
Electricity	= \$/kWhr * hp * 1 kWhr/1.341 hp * 8760 hr/yr	40.5
	<b>Total DC =</b>	<b>\$297,855</b>
<b>Indirect Annual Costs (IC)</b>		
Overhead	= 60% of the Sum of Total Labor + Materials	\$48,728
Administrative	= 2% of Total Capital Investment	
Property Tax	= 1% of Total Capital Investment	
Insurance	= 1% of Total Capital Investment	
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)	
	<b>Total IC =</b>	<b>\$181,123</b>
<b>TOTAL ANNUAL OPERATING COSTS =</b>		<b>\$478,978</b>

LPA CATALYTIC THERMAL OXIDIZER  
BASIS: Vendor Quotations, OAQPS Cost Manual (Sixth Edition)

COST ITEM	COST	TOTALS
<b><u>Direct Costs</u></b>		
<b>Purchased Equipment Costs: One 2,500 acfm CTO Unit</b>		
Thermal Oxidizer (User Input Cost: Vendor Info and QAQPS USEPA Factor)	\$ 560,000	N/A
Ancillary Equipment	\$84,000	
Blower	\$30,000	
Ancillary Equipment	\$4,500	
	<b>Sum = "A" =</b>	<b>\$ 678,500.00</b>
Instrumentation (0.10 * A)	\$67,850	
Sales Taxes (0.03 * A)	\$20,355	
Freight (0.05 * A)	\$33,925	
	<b>Purchased Equipment Cost = "B" =</b>	<b>\$800,630</b>
<b><u>Direct Installation Costs</u></b>		
Foundation and Supports (0.08 * B)	\$64,050	
Handling and Errection (0.14 * B)	\$112,088	
Electrical (0.04 * B)	\$32,025	
Piping, Ductwork, and Installation (0.02 * B)	\$16,013	
Insulation for Ductwork (0.01 * B)	\$8,006	
Painting (0.01 * B)	\$8,006	
	<b>Direct Installation Cost =</b>	<b>\$240,189</b>
Site Preparation (User Inputs Actual Cost)	\$150,000	
Facilities and Buildings (User Inputs Actual Cost)	\$25,000	
	<b>Total Direct Cost =</b>	<b>\$1,215,819</b>
<b><u>Indirect Cost (Installation)</u></b>		
Engineering (0.10 * B)	\$80,063	
Construction and Field Expenses (0.05 * B)	\$40,032	
Contractor Fees (0.10 * B)	\$80,063	
Start-Up (0.02 * B)	\$16,013	
Performance Test (0.01 * B)	\$8,006	
Contingencies (0.03 * B)	\$24,019	
	<b>Total Indirect Cost =</b>	<b>\$248,195</b>
<b>TOTAL CAPITAL INVESTMENT =</b>		<b>\$1,464,014</b>
<b><u>Direct Annual Costs (DC)</u></b>		
<b><u>Operating Labor</u></b>		
Operator	<b>(Basis of Calculations)</b> = (hr/shift * shifts/day * days/yr * \$/hr) 0.5	\$14,600
Supervisor	= (15% of Operator Cost)	\$2,190
Operating Materials	(If Any)	\$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * \$/hr) 0.5	\$14,600
Maintenance Materials	= 100% of Maintenance Labor	\$14,600
Replacement Labor	N/A	\$0
Catalyst Cost	= CF cat * \$850/CF * 1 @ 2 years 30	\$12,750
<b><u>Utilities:</u></b>		
Fuel (natural gas)	(cfm/1000 * \$/1000 cf * 60 min/hr * 8760 hr/yr) 47.0	\$84,979
Electricity	= \$/kWhr * hp * 1 kWhr/1.341 hp * 8760 hr/yr 40.5	\$15,345
	<b>Total DC =</b>	<b>\$159,064</b>
<b><u>Indirect Annual Costs (IC)</u></b>		
Overhead	= 60% of the Sum of Total Labor + Materials \$45,990	\$27,594
Administrative	= 2% of Total Capital Investment	\$29,280
Property Tax	= 1% of Total Capital Investment	\$14,640
Insurance	= 1% of Total Capital Investment	\$14,640
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)	\$149,110
	<b>Total IC =</b>	<b>\$235,264</b>
<b>TOTAL ANNUAL OPERATING COSTS =</b>		<b>\$394,328</b>



**LPA REGENERATIVE THERMAL OXIDIZER**  
**BASIS: Vendor Quotations, OAQPS Cost Manual (Sixth Edition)**

COST ITEM	COST	TOTALS
<b><u>Direct Costs</u></b>		
<b><u>Purchased Equipment Costs</u></b>		
Thermal Oxidizer (User Input Cost: Vendor Info and QAQPS USEPA Factor)	430,000	N/A
Ancillary Equipment	\$64,500	
Blower	\$30,000	
Ancillary Equipment	\$4,500	
	<b>Sum = "A" =</b>	<b>529,000</b>
Instrumentation (0.10 * A)	\$52,900	
Sales Taxes (0.03 * A)	\$15,870	
Freight (0.05 * A)	\$26,450	
	<b>Purchased Equipment Cost = "B" =</b>	<b>\$624,220</b>
<b><u>Direct Installation Costs</u></b>		
Foundation and Supports (0.08 * B)	\$49,938	
Handling and Erection (0.14 * B)	\$87,391	
Electrical (0.04 * B)	\$24,969	
Piping, Ductwork, and Installation (0.02 * B)	\$12,484	
Insulation for Ductwork (0.01 * B)	\$6,242	
Painting (0.01 * B)	\$6,242	
	<b>Direct Installation Cost =</b>	<b>\$187,266</b>
Site Preparation (User Inputs Actual Cost)	\$150,000	
Facilities and Buildings (User Inputs Actual Cost)	\$25,000	
	<b>Total Direct Cost =</b>	<b>\$986,486</b>
<b><u>Indirect Cost (Installation)</u></b>		
Engineering (0.10 * B)	\$62,422	
Construction and Field Expenses (0.05 * B)	\$31,211	
Contractor Fees (0.10 * B)	\$62,422	
Start-Up (0.02 * B)	\$12,484	
Performance Test (0.01 * B)	\$6,242	
Contingencies (0.03 * B)	\$18,727	
	<b>Total Indirect Cost =</b>	<b>\$193,508</b>
<b>TOTAL CAPITAL INVESTMENT =</b>		<b>\$1,179,994</b>
<b><u>Direct Annual Costs (DC)</u></b>		
<b><u>Operating Labor</u></b>		
<b><u>(Basis of Calculations)</u></b>		
Operator	= (hr/shift * shifts/day * days/yr * \$/hr) 0.5	\$16,425
Supervisor	= (15% of Operator Cost)	\$2,464
Operating Materials	(If Any)	\$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * \$/hr) 0.5	\$16,425
Maintenance Materials	= 100% of Maintenance Labor	\$16,425
Replacement Labor	N/A	\$0
Parts Cost	N/A	\$0
<b><u>Utilities:</u></b>		
Fuel (natural gas)	(cfm/1000 * \$/1000 cf * 60 min/hr * 8760 hr/yr) 45.0	\$81,363
Electricity	= \$/kWhr * kWhr * 8760 hr/yr 48.0	\$24,388
Media Replacement	= CF media * \$50/CF / 2 years 400.0	\$10,000
	<b>Total DC =</b>	<b>\$167,489</b>
<b><u>Indirect Annual Costs (IC)</u></b>		
Overhead	= 60% of the Sum of Total Labor + Materials \$51,739	\$31,043
Administrative	= 2% of Total Capital Investment	\$23,600
Property Tax	= 1% of Total Capital Investment	\$11,800
Insurance	= 1% of Total Capital Investment	\$11,800
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)	\$120,182
	<b>Total IC =</b>	<b>\$198,425</b>
<b>TOTAL ANNUAL OPERATING COSTS =</b>		<b>\$365,915</b>

LPA RECUPERATIVE THERMAL OXIDIZER  
BASIS: Vendor Quotations, OAQPS Cost Manual (Sixth Edition)

COST ITEM	COST	TOTALS
<b><u>Direct Costs</u></b>		
<b><u>Purchased Equipment Costs:</u></b>		
Thermal Oxidizer (User Input Cost: Vendor Info and QAQPS USEPA Factor)	\$650,000	N/A
Ancillary Equipment	\$97,500	
Blower	\$30,000	
Ancillary Equipment	\$4,500	
	<b>Sum = "A" =</b>	<b>\$782,000</b>
Instrumentation (0.10 * A)	\$78,200	
Sales Taxes (0.03 * A)	\$23,460	
Freight (0.05 * A)	\$39,100	
	<b>Purchased Equipment Cost = "B" =</b>	<b>\$922,760</b>
<b><u>Direct Installation Costs</u></b>		
Foundation and Supports (0.08 * B)	\$73,821	
Handling and Erection (0.14 * B)	\$129,186	
Electrical (0.04 * B)	\$36,910	
Piping, Ductwork, and Installation (0.02 * B)	\$18,455	
Insulation for Ductwork (0.01 * B)	\$9,228	
Painting (0.01 * B)	\$9,228	
	<b>Direct Installation Cost =</b>	<b>\$276,828</b>
Site Preparation (User Inputs Actual Cost)	\$150,000	
Facilities and Buildings (User Inputs Actual Cost)	\$25,000	
	<b>Total Direct Cost =</b>	<b>\$1,374,588</b>
<b><u>Indirect Cost (Installation)</u></b>		
Engineering (0.10 * B)	\$92,276	
Construction and Field Expenses (0.05 * B)	\$46,138	
Contractor Fees (0.10 * B)	\$92,276	
Start-Up (0.02 * B)	\$18,455	
Performance Test (0.01 * B)	\$9,228	
Contingencies (0.03 * B)	\$27,683	
	<b>Total Indirect Cost =</b>	<b>\$286,056</b>
<b>TOTAL CAPITAL INVESTMENT =</b>		<b>\$1,660,644</b>
<b><u>Direct Annual Costs (DC)</u></b>		
<b><u>Operating Labor</u></b>		
Operator	<b>(Basis of Calculations)</b> = (hr/shift * shifts/day * days/yr * \$/hr) 0.5	\$16,425
Supervisor	= (15% of Operator Cost)	\$2,464
Operating Materials	(If Any)	\$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * \$/hr) 0.5	\$16,425
Maintenance Materials	= 100% of Maintenance Labor	\$16,425
Replacement Labor	N/A	\$0
Parts Cost	N/A	\$0
<b><u>Utilities:</u></b>		
Fuel (natural gas)	(cfm/1000 * \$/1000 cf * 60 min/hr * 8760 hr/yr) 53.0	\$95,827
Electricity	= \$/kWhr * hp * 1 kWhr/1.341 hp * 8760 hr/yr 40.0	\$15,155
	<b>Total DC =</b>	<b>\$162,721</b>
<b><u>Indirect Annual Costs (IC)</u></b>		
Overhead	= 60% of the Sum of Total Labor + Materials \$51,739	\$31,043
Administrative	= 2% of Total Capital Investment	\$33,213
Property Tax	= 1% of Total Capital Investment	\$16,606
Insurance	= 1% of Total Capital Investment	\$16,606
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)	\$258,367
	<b>Total IC =</b>	<b>\$355,836</b>
<b>TOTAL ANNUAL OPERATING COSTS =</b>		<b>\$518,557</b>

**LPA WET SCRUBBER**  
BASIS: Vendor Quotations, OAQPS Cost Manual (Sixth Edition)

COST ITEM	COST	TOTALS
<b><u>Direct Costs</u></b>		
<b>Purchased Equipment Costs: Scrubber</b>		
Scrubber (User Input Cost: Vendor Info)	\$120,000	N/A
Ancillary Equipment	\$18,000	
Blower	\$30,000	
Ancillary Equipment	\$4,500	
	<b>Sum = "A" =</b>	<b>\$172,500</b>
Instrumentation (0.10 * A)	\$15,525	
Sales Taxes (0.03 * A)	\$8,625	
Freight (0.05 * A)	\$13,800	
	<b>Purchased Equipment Cost = "B" =</b>	<b>\$210,450</b>
<b><u>Direct Installation Costs</u></b>		
Foundation and Supports (0.12 * B)	\$25,254	
Handling and Erection (0.40 * B)	\$84,180	
Electrical (0.01 * B)	\$2,105	
Piping, Ductwork, and Installation (0.30 * B)	\$63,135	
Insulation (0.01 * B)	\$2,105	
Painting (0.01 * B)	\$2,105	
	<b>Direct Installation Cost =</b>	<b>\$178,883</b>
Site Preparation (User Inputs Actual Cost)	\$150,000	
Facilities and Buildings (User Inputs Actual Cost)	\$25,000	
	<b>Total Direct Cost =</b>	<b>\$564,333</b>
<b><u>Indirect Cost (Installation)</u></b>		
Engineering (0.10 * B)	\$21,045	
Construction and Field Expenses (0.10 * B)	\$21,045	
Contractor Fees (0.10 * B)	\$21,045	
Start-Up (0.01 * B)	\$2,105	
Performance Test (0.01 * B)	\$2,105	
Contingencies (0.03 * B)	\$6,314	
	<b>Total Indirect Cost =</b>	<b>\$73,658</b>
<b>TOTAL CAPITAL INVESTMENT =</b>		<b>\$637,990</b>
<b><u>Direct Annual Costs (DC)</u></b>		
<b><u>Operating Labor</u></b>		
<b>(Basis of Calculations)</b>		
Operator = (hr/shift * shifts/day * days/yr * \$/hr)	0.50	\$16,425
Supervisor = (15% of Operator Cost)		\$2,464
Operating Materials (If Any)		\$0
Maintenance Labor = (hr/shift * shifts/day * days/yr * \$/hr)	0.50	\$16,425
Maintenance Materials = 100% of Maintenance Labor		\$16,425
Replacement Labor (Actual Cost Per User)		\$0
Parts Cost (5% of Purchased Cost)		\$0
<b><u>Utilities:</u></b>		
Electricity = \$/kWhr * hp * 1 kWhr/1.341 hp * 8760 hr/yr	10	\$3,789
Water = \$/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	38	\$53,327
Wastewater = \$/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	38	\$65,910
Caustic = lb/hr * \$/lb * 8760 hr/yr	46.3	\$125,597
	<b>Total DC =</b>	<b>\$300,362</b>
<b><u>Indirect Annual Costs (IC)</u></b>		
Overhead = 60% of the Sum of Total Labor	\$51,739	\$31,043
Administrative = 2% of Total Capital Investment		\$12,760
Property Tax = 1% of Total Capital Investment		\$6,380
Insurance = 1% of Total Capital Investment		\$6,380
Capital Recovery (Based on 8% & 20 year life: Factor = 0.10185)		\$64,979
	<b>Total IC =</b>	<b>\$121,542</b>
<b>TOTAL ANNUAL OPERATING COSTS =</b>		<b>\$421,904</b>

LPA CARBON ADSORPTION/THERMAL OXIDIZER  
BASIS: Vendor Quotations, OAQPS Cost Manual (Sixth Edition)

COST ITEM	COST	TOTALS
<b>Direct Costs</b>		
<b>Purchased Equipment Costs: Carbon Adsorber and Thermal Oxidizer</b>		
Adsorber (User Input Cost: QAQPS Info)	\$219,000	N/A
Ancillary Equipment	\$54,750	
Thermal Oxidizer (Input Cost: Vendor Info and QAQPS USEPA Factor)	\$220,000	
Ancillary Equipment	\$33,000	
Blower	\$30,000	
Ancillary Equipment	\$4,500	
	<b>Sum = "A" =</b>	<b>\$561,250</b>
Instrumentation (0.10 * A)	\$56,125	
Sales Taxes (0.03 * A)	\$16,838	
Freight (0.05 * A)	\$28,063	
	<b>Purchased Equipment Cost = "B" =</b>	<b>\$662,275</b>
<b>Direct Installation Costs</b>		
Foundation and Supports (0.08 * B)	\$52,982	
Handling and Erection (0.14 * B)	\$92,719	
Electrical (0.04 * B)	\$26,491	
Piping, Ductwork, and Installation (0.02 * B)	\$13,246	
Insulation for Ductwork (0.01 * B)	\$6,623	
Painting (0.02 * B)	\$13,246	
	<b>Direct Installation Cost =</b>	<b>\$205,305</b>
Site Preparation (User Inputs Actual Cost)	\$150,000	
Facilities and Buildings (User Inputs Actual Cost)	\$25,000	
	<b>Total Direct Cost =</b>	<b>\$1,042,580</b>
<b>Indirect Cost (Installation)</b>		
Engineering (0.10 * B)	\$66,228	
Construction and Field Expenses (0.05 * B)	\$33,114	
Contractor Fees (0.10 * B)	\$66,228	
Start-Up (0.02 * B)	\$13,246	
Performance Test (0.01 * B)	\$6,623	
Contingencies (0.03 * B)	\$19,868	
	<b>Total Indirect Cost =</b>	<b>\$205,305</b>
<b>TOTAL CAPITAL INVESTMENT =</b>		<b>\$1,247,886</b>
<b>Direct Annual Costs (DC)</b>		
<b>Operating Labor (Basis of Calculations)</b>		
Operator = (hr/shift * shifts/day * days/yr * \$/hr)	0.50	\$16,425
Supervisor = (15% of Operator Cost)		\$2,464
Operating Materials (If Any)		\$0
Maintenance Labor = (hr/shift * shifts/day * days/yr * \$/hr)	0.50	\$16,425
Maintenance Materials = 100% of Maintenance Labor		\$16,425
Carbon Replacement Labor (Estimated hours x labor cost)	32	\$1,440
Parts Cost (5% of Purchased Cost)		\$0
<b>Utilities:</b>		
Replacement Carbon	220,752	\$220,752
Solid waste disposal = \$/ton * lbs/yr/2000	110	\$11,479
Steam = 4.0 lbs steam/lb Organic adsorbed * \$/lb	331128	\$7,682
Fuel (natural gas) (cfm/1000 * \$/1000 cf * 60 min/hr * 8760 hr/yr)	3.0	\$5,424
Electricity = \$/kWh*hp*1 kWh/1.341 hp*8760 hr/yr	4.5	\$1,705
	<b>Total DC =</b>	<b>\$300,221</b>
<b>Indirect Annual Costs (IC)</b>		
Overhead = 60% of the Sum of Total Labor	\$53,179	\$31,907
Administrative = 2% of Total Capital Investment		\$24,958
Property Tax = 1% of Total Capital Investment		\$12,479
Insurance = 1% of Total Capital Investment		\$12,479
Capital Recovery (Based on 8% & 20 year life: Factor = 0.10185)		\$127,097
	<b>Total IC =</b>	<b>\$208,920</b>
<b>TOTAL ANNUAL OPERATING COSTS =</b>		<b>\$509,141</b>

LPA REFRIGERATED CONDENSER  
BASIS: Vendor Quotations, OAQPS Cost Manual (Sixth Edition)

COST ITEM	COST	TOTALS
<b>Direct Costs</b>		
<b>Purchased Equipment Costs: Refrigerated Condenser</b>		
Condenser (User Input Cost: QAQPS Info)	\$219,000	N/A
Ancillary Equipment	\$54,750	
Blower	\$30,000	
Ancillary Equipment	\$4,500	
	<b>Sum = "A" =</b>	<b>\$308,250</b>
Instrumentation (0.10 * A)	\$30,825	
Sales Taxes (0.03 * A)	\$9,248	
Freight (0.05 * A)	\$15,413	
	<b>Purchased Equipment Cost = "B" =</b>	<b>\$363,735</b>
<b>Direct Installation Costs</b>		
Foundation & Supports (0.08 * B)	\$29,099	
Handling & Errection (0.14 * B)	\$50,923	
Electrical (0.04 * B)	\$14,549	
Piping, Ductwork & Installation (0.02 * B)	\$7,275	
Insulation for Ductwork (0.01 * B)	\$3,637	
Painting (0.02 * B)	\$7,275	
	<b>Direct Installation Cost =</b>	<b>\$112,758</b>
Site Preparation (User Inputs Actual Cost)	\$150,000	
Facilities & Buildings (User Inputs Actual Cost)	\$25,000	
	<b>Total Direct Cost =</b>	<b>\$651,493</b>
<b>Indirect Cost (Installation)</b>		
Engineering (0.10 * B)	\$36,374	
Construction & Field Expenses (0.05 * B)	\$18,187	
Contractor Fees (0.10 * B)	\$36,374	
Start-Up (0.02 * B)	\$7,275	
Performance Test (0.01 * B)	\$3,637	
Contingencies (0.03 * B)	\$10,912	
	<b>Total Indirect Cost =</b>	<b>\$112,758</b>
<b>TOTAL CAPITAL INVESTMENT =</b>		<b>\$764,251</b>
<b>Direct Annual Costs (DC)</b>		
<b>Operating Labor</b>		
<b>(Basis of Calculations)</b>		
Operator = (hr/shift * shifts/day * days/yr * \$/hr)	0.50	\$16,425
Supervisor = (15% of Operator Cost)		\$2,464
Operating Materials (If Any)		\$0
Maintenance Labor = (hr/shift * shifts/day * days/yr * \$/hr)	0.20	\$6,570
Maintenance Materials = 100% of Maintenance Labor		\$6,570
Replacement Labor (Actual Cost Per User)		\$0
Parts Cost (5% of Purchased Cost)		\$0
<b>Utilities:</b>		
Liquid Waste Disposal = \$/lb * lb/hr * 8760 hr/yr	140	\$183,960
Electricity = \$/kWhr * hp * 1 kWhr/1.341 hp * 8760 hr/yr	45	\$17,050
Wastewater = \$/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	1	\$1,734
	<b>Total DC =</b>	<b>\$233,038</b>
<b>Indirect Annual Costs (IC)</b>		
Overhead = 60% of the Sum of Total Labor	\$32,029	\$19,217
Administrative = 2% of Total Capital Investment		\$15,285
Property Tax = 1% of Total Capital Investment		\$7,643
Insurance = 1% of Total Capital Investment		\$7,643
Capital Recovery (Based on 8% & 20 year life: Factor = 0.10185)		\$77,839
	<b>Total IC =</b>	<b>\$127,626</b>
<b>TOTAL ANNUAL OPERATING COSTS =</b>		<b>\$360,665</b>

# CAPITAL COST ESTIMATE

## LPA FLARE

BASIS: Vendor Quotations, OAQPS Cost Manual (Sixth Edition)

March-14

COST ITEM	COST	TOTALS
<b>Direct Costs</b>		
<b>Purchased Equipment Costs:</b>		
Flare	\$ 208,450.00	N/A
Steam Vent	\$ 6,350.00	
Knock Out Drum	\$ 1,500.00	
Fan	\$25,000	
Ancillary Equipment	\$3,750	
	<b>Sum = "A" =</b>	<b>\$ 245,050.00</b>
Instrumentation (0.10 * A)	\$24,505	
Sales Taxes (0.03 * A)	\$7,352	
Freight (0.05 * A)	\$12,253	
	<b>Purchased Equipment Cost = "B" =</b>	<b>\$289,159</b>
<b>Direct Installation Costs</b>		
Foundation & Supports (0.08 * B)	\$23,133	
Handling & Errection (0.14 * B)	\$40,482	
Electrical (0.04 * B)	\$11,566	
Piping, Ductwork & Installation (0.02 * B)	\$5,783	
Insulation for Ductwork (0.01 * B)	\$2,892	
Painting (0.02 * B)	\$5,783	
	<b>Direct Installation Cost =</b>	<b>\$89,639</b>
Site Preparation (User Inputs Actual Cost)	\$150,000	
Facilities & Buildings (User Inputs Actual Cost)	\$25,000	
	<b>Total Direct Cost =</b>	<b>\$553,798</b>
<b>Indirect Cost (Installation)</b>		
Engineering (0.10 * B)	\$28,916	
Construction & Field Expenses (0.05 * B)	\$14,458	
Contractor Fees (0.10 * B)	\$28,916	
Start-Up (0.02 * B)	\$5,783	
Performance Test (0.01 * B)	\$2,892	
Contingencies (0.03 * B)	\$8,675	
	<b>Total Indirect Cost =</b>	<b>\$89,639</b>
<b>TOTAL CAPITAL INVESTMENT =</b>		<b>\$643,438</b>
<b>Direct Annual Costs (DC)</b>		
<b>Operating Labor</b>		<b>(Basis of Calculations)</b>
Operator	= 630 hr/yr	630.00
Supervisor	= (15% of Operator Cost)	
Operating Materials	(If Any)	
Maintenance Labor	= (hr/shift * shifts/day * days/yr * \$/hr)	0.50
Maintenance Materials	= 100% of Maintenance Labor	
Replacement Labor	(Actual Cost Per User)	
Parts Cost	(5% of Purchased Cost)	
<b>Utilities:</b>		
Liquid Waste Disposal	= \$/lb * lb/hr * 8760 hr/yr	140
Electricity	= \$/kWhr * hp * 1 kWhr/1.341 hp * 8760 hr/yr	45
Wastewater	= \$/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	1
Fuel	= \$/1000 cf * scf/min * 60 min * 8760 hr/yr	1137
	<b>Total DC =</b>	<b>\$2,323,965</b>
<b>Indirect Annual Costs (IC)</b>		
Overhead	= 60% of the Sum of Total Labor	\$65,453
Administrative	= 2% of Total Capital Investment	
Property Tax	= 1% of Total Capital Investment	
Insurance	= 1% of Total Capital Investment	
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)	
	<b>Total IC =</b>	<b>\$130,543</b>
<b>TOTAL ANNUAL OPERATING COSTS =</b>		<b>\$2,454,509</b>



# HPA VOC COST TABLES

## HPA THERMAL OXIDIZER

BASIS: Vendor Quotations, OAQPS Cost Manual (Sixth Edition)

COST ITEM	COST	TOTALS
<b>Direct Costs</b>		
<b>Purchased Equipment Costs: One 39,000 acfm TO Unit</b>		
Thermal Oxidizer (Input Cost: Vendor Info and OAQPS USEPA Factor)	\$720,000	N/A
Ancillary Equipment	\$108,000	
Bromine Scrubber	\$350,000	
Ancillary Equipment	\$52,500	
	<b>Sum = "A" =</b>	<b>\$1,230,500</b>
Instrumentation (0.10 * A)	\$123,050	
Sales Taxes (0.03 * A)	\$36,915	
Freight (0.05 * A)	\$61,525	
	<b>Purchased Equipment Cost = "B" =</b>	<b>\$1,451,990</b>
<b>Direct Installation Costs</b>		
Foundation and Supports (0.08 * B)	\$116,159	
Handling and Erection (0.14 * B)	\$203,279	
Electrical (0.04 * B)	\$58,080	
Piping, Ductwork, and Installation (0.02 * B)	\$29,040	
Insulation for Ductwork (0.01 * B)	\$14,520	
Painting (0.01 * B)	\$14,520	
	<b>Direct Installation Cost =</b>	<b>\$435,597</b>
Site Preparation (User Inputs Actual Cost)	\$150,000	
Facilities and Buildings (User Inputs Actual Cost)	\$25,000	
	<b>Total Direct Cost =</b>	<b>\$2,062,587</b>
<b>Indirect Cost (Installation)</b>		
Engineering (0.10 * B)	\$145,199	
Construction and Field Expenses (0.05 * B)	\$72,600	
Contractor Fees (0.10 * B)	\$145,199	
Start-Up (0.02 * B)	\$29,040	
Performance Test (0.01 * B)	\$14,520	
Contingencies (0.03 * B)	\$43,560	
	<b>Total Indirect Cost =</b>	<b>\$450,117</b>
<b>TOTAL CAPITAL INVESTMENT =</b>		<b>\$2,512,704</b>
<b>Direct Annual Costs (DC)</b>		
<b>Operating Labor</b>		
Operator	<b>(Basis of Calculations)</b> = (hr/shift * shifts/day * days/yr * \$/hr)	0.5
Supervisor	= (15% of Operator Cost)	
Operating Materials	(If Any)	
Maintenance Labor	= (hr/shift * shifts/day * days/yr * \$/hr)	0.2
Maintenance Materials	= 100% of Maintenance Labor	
Replacement Labor	N/A	
Parts Cost	N/A	
<b>Utilities:</b>		
Fuel (natural gas)	(cfm/1000 * \$/1000 cf * 60 min/hr * 8760 hr/yr)	6425.9
Electricity	= \$/kWhr * hp * 1 kWhr/1.341 hp * 8760 hr/yr	127.0
Nitrogen for carrier	\$/1000 scf * scfm carrier gas * 60 min/hr * 8760 hr/yr	20000.0
Water	= \$/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	76
Wastewater	= \$/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	76
Caustic	= lb/hr caustic * \$/lb * 8760	55
	<b>Total DC =</b>	<b>\$29,168,177</b>
<b>Indirect Annual Costs (IC)</b>		
Overhead	= 60% of the Sum of Total Labor + Materials	\$32,029
Administrative	= 2% of Total Capital Investment	\$50,254
Property Tax	= 1% of Total Capital Investment	\$25,127
Insurance	= 1% of Total Capital Investment	\$25,127
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)	\$255,919
	<b>Total IC =</b>	<b>\$375,644</b>
<b>TOTAL ANNUAL OPERATING COSTS =</b>		<b>\$29,543,821</b>

HPA CATALYTIC THERMAL OXIDIZER  
BASIS: Vendor Quotations, OAQPS Cost Manual (Sixth Edition)

COST ITEM	COST	TOTALS
<b><u>Direct Costs</u></b>		
<u>Existing Unit No construction necessary including bromine scrubber</u>		
Thermal Oxidizer (User Input Cost: Vendor Info and QAQPS USEPA Factor)	\$ -	
Ancillary Equipment	\$0	N/A
	<b>Sum = "A" =</b>	<b>\$0</b>
Instrumentation (0.10 * A)	\$0	
Sales Taxes (0.03 * A)	\$0	
Freight (0.05 * A)	\$0	
	<b>Purchased Equipment Cost = "B" =</b>	<b>\$0</b>
<b><u>Direct Installation Costs</u></b>		
Foundation and Supports (0.08 * B)	\$0	
Handling and Erection (0.14 * B)	\$0	
Electrical (0.04 * B)	\$0	
Piping, Ductwork, and Installation (0.02 * B)	\$0	
Insulation for Ductwork (0.01 * B)	\$0	
Painting (0.01 * B)	\$0	
	<b>Direct Installation Cost =</b>	<b>\$0</b>
Site Preparation (User Inputs Actual Cost)	\$0	
Facilities and Buildings (User Inputs Actual Cost)	\$0	
	<b>Total Direct Cost =</b>	<b>\$0</b>
<b><u>Indirect Cost (Installation)</u></b>		
Engineering (0.10 * B)	\$0	
Construction and Field Expenses (0.05 * B)	\$0	
Contractor Fees (0.10 * B)	\$0	
Start-Up (0.02 * B)	\$0	
Performance Test (0.01 * B)	\$0	
Contingencies (0.03 * B)	\$0	
	<b>Total Indirect Cost =</b>	<b>\$0</b>
<b>TOTAL CAPITAL INVESTMENT =</b>		<b>\$0</b>
<b><u>Direct Annual Costs (DC)</u></b>		
<u>Operating Labor</u>		
<b><u>(Basis of Calculations)</u></b>		
Operator	= (hr/shift * shifts/day * days/yr * \$/hr) 0.5	\$16,425
Supervisor	= (15% of Operator Cost)	\$2,464
Operating Materials	(If Any)	\$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * \$/hr) 0.2	\$6,570
Maintenance Materials	= 100% of Maintenance Labor	\$6,570
Replacement Labor	N/A	\$0
Catalyst Cost	= CF cat * \$850/CF * 1 @ 2 years 20	\$8,500
<u>Utilities:</u>		
Fuel (natural gas)	(cfm/1000 * \$/1000 cf * 60 min/hr * 8760 hr/yr) 196.1	\$354,522
Electricity	= \$/kWhr * hp * 1 kWhr/1.341 hp * 8760 hr/yr 15.0	\$5,683
Wastewater	= \$/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr 15	\$26,017
Sodium Formate	= lb/hr * \$/lb * 8760 hr/yr 15.0	\$40,734
	<b>Total DC =</b>	<b>\$467,486</b>
<b><u>Indirect Annual Costs (IC)</u></b>		
Overhead	= 60% of the Sum of Total Labor + Materials \$32,029	\$19,217
Administrative	= 2% of Total Capital Investment	\$0
Property Tax	= 1% of Total Capital Investment	\$0
Insurance	= 1% of Total Capital Investment	\$0
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)	\$0
	<b>Total IC =</b>	<b>\$19,217</b>
<b>TOTAL ANNUAL OPERATING COSTS =</b>		<b>\$486,703</b>



# HPA REGENERATIVE THERMAL OXIDIZER/BROMINE SCRUBBER

BASIS: Vendor Quotations, OAQPS Cost Manual (Sixth Edition)

COST ITEM	COST	TOTALS
<b><u>Direct Costs</u></b>		
<b><u>Purchased Equipment Costs</u></b>		
Thermal Oxidizer (User Input Cost: Vendor Info and QAQPS USEPA Factor)	2,101,175	N/A
Ancillary Equipment	\$315,176	
Bromine Scrubber	\$350,000	
Ancillary Equipment	\$52,500	
	<b>Sum = "A" =</b>	<b>2,818,852</b>
Instrumentation (0.10 * A)	\$281,885	
Sales Taxes (0.03 * A)	\$84,566	
Freight (0.05 * A)	\$140,943	
	<b>Purchased Equipment Cost = "B" =</b>	<b>\$3,326,245</b>
<b><u>Direct Installation Costs</u></b>		
Foundation and Supports (0.08 * B)	\$266,100	
Handling and Erection (0.14 * B)	\$465,674	
Electrical (0.04 * B)	\$133,050	
Piping, Ductwork, and Installation (0.02 * B)	\$66,525	
Insulation for Ductwork (0.01 * B)	\$33,262	
Painting (0.01 * B)	\$33,262	
	<b>Direct Installation Cost =</b>	<b>\$997,874</b>
Site Preparation (User Inputs Actual Cost)	\$150,000	
Facilities and Buildings (User Inputs Actual Cost)	\$25,000	
	<b>Total Direct Cost =</b>	<b>\$4,499,119</b>
<b><u>Indirect Cost (Installation)</u></b>		
Engineering (0.10 * B)	\$332,625	
Construction and Field Expenses (0.05 * B)	\$166,312	
Contractor Fees (0.10 * B)	\$332,625	
Start-Up (0.02 * B)	\$66,525	
Performance Test (0.01 * B)	\$33,262	
Contingencies (0.03 * B)	\$99,787	
	<b>Total Indirect Cost =</b>	<b>\$1,031,136</b>
<b>TOTAL CAPITAL INVESTMENT =</b>		<b>\$5,530,255</b>
<b><u>Direct Annual Costs (DC)</u></b>		
<b><u>Operating Labor</u></b>		
<b><u>(Basis of Calculations)</u></b>		
Operator	= (hr/shift * shifts/day * days/yr * \$/hr) 0.5	\$16,425
Supervisor	= (15% of Operator Cost)	\$2,464
Operating Materials	(If Any)	\$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * \$/hr) 0.2	\$6,570
Maintenance Materials	= 100% of Maintenance Labor	\$6,570
Replacement Labor	N/A	\$0
Parts Cost	N/A	\$0
<b><u>Utilities:</u></b>		
Fuel (natural gas)	(cfm/1000 * \$/1000 cf * 60 min/hr * 8760 hr/yr) 642.6	\$1,161,842
Electricity	= \$/kWhr * kWhr * 8760 hr/yr 395.0	\$200,692
Nitrogen for carrier	\$/1000 scf * scfm carrier gas * 60 min/hr * 8760 hr/yr 20000.0	\$17,082,000
Water	= \$/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr 76	\$106,551
Wastewater	= \$/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr 76	\$131,692
Caustic	= lb/hr caustic * \$/lb * 8760 55	\$149,358
Media Replacement	= CF media * \$50/CF / 3 years 10000.0	\$166,667
	<b>Total DC =</b>	<b>\$19,030,830</b>
<b><u>Indirect Annual Costs (IC)</u></b>		
Overhead	= 60% of the Sum of Total Labor + Materials \$32,029	\$19,217
Administrative	= 2% of Total Capital Investment	\$110,605
Property Tax	= 1% of Total Capital Investment	\$55,303
Insurance	= 1% of Total Capital Investment	\$55,303
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185) \$418,691	\$418,691
	<b>Total IC =</b>	<b>\$659,119</b>
<b>TOTAL ANNUAL OPERATING COSTS =</b>		<b>\$19,689,949</b>

HPA RECUPERATIVE THERMAL OXIDIZER  
BASIS: Vendor Quotations, OAQPS Cost Manual (Sixth Edition)

COST ITEM	COST	TOTALS
<b><u>Direct Costs</u></b>		
<b><u>Purchased Equipment Costs:</u></b>		
Thermal Oxidizer (User Input Cost: Vendor Info and QAQPS UEPA Factor)	\$1,095,000	N/A
Ancillary Equipment	\$164,250	
Bromine Scrubber	\$350,000	
Ancillary Equipment	\$52,500	
	<b>Sum = "A" =</b>	<b>\$1,661,750</b>
Instrumentation (0.10 * A)	\$166,175	
Sales Taxes (0.03 * A)	\$49,853	
Freight (0.05 * A)	\$83,088	
	<b>Purchased Equipment Cost = "B" =</b>	<b>\$1,960,865</b>
<b><u>Direct Installation Costs</u></b>		
Foundation and Supports (0.08 * B)	\$156,869	
Handling and Errection (0.14 * B)	\$274,521	
Electrical (0.04 * B)	\$78,435	
Piping, Ductwork, and Installation (0.02 *B)	\$39,217	
Insulation for Ductwork (0.01 * B)	\$19,609	
Painting (0.01 * B)	\$19,609	
	<b>Direct Installation Cost =</b>	<b>\$588,260</b>
Site Preparation (User Inputs Actual Cost)	\$150,000	
Facilities and Buildings (User Inputs Actual Cost)	\$25,000	
	<b>Total Direct Cost =</b>	<b>\$2,724,125</b>
<b><u>Indirect Cost (Installation)</u></b>		
Engineering (0.10 * B)	\$196,087	
Construction and Field Expenses (0.05 *B)	\$98,043	
Contractor Fees (0.10 *B)	\$196,087	
Start-Up (0.02 *B)	\$39,217	
Performance Test (0.01 *B)	\$19,609	
Contingencies (0.03 * B)	\$58,826	
	<b>Total Indirect Cost =</b>	<b>\$607,868</b>
<b>TOTAL CAPITAL INVESTMENT =</b>		<b>\$3,331,993</b>
<b><u>Direct Annual Costs (DC)</u></b>		
<b><u>Operating Labor</u></b>		
Operator	<b>(Basis of Calculations)</b> = (hr/shift * shifts/day * days/yr * \$/hr)	0.5
Supervisor	= (15% of Operator Cost)	
Operating Materials	(If Any)	
Maintenance Labor	= (hr/shift * shifts/day * days/yr * \$/hr)	0.2
Maintenance Materials	= 100% of Maintenance Labor	
Replacement Labor	N/A	
Parts Cost	N/A	
<b><u>Utilities:</u></b>		
Fuel (natural gas)	(cfm/1000 * \$/1000 cf * 60 min/hr * 8760 hr/yr)	3212.9
Electricity	= \$/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	301.7
Nitrogen for carrier	\$/1000 scf * scfm carrier gas * 60 min/hr*8760 hr/yr	20000.0
Water	= \$/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	76
Wastewater	= \$/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	76
Caustic	=lb/hr caustic * \$/lb*8760	55
	<b>Total DC =</b>	<b>\$23,425,138</b>
<b><u>Indirect Annual Costs (IC)</u></b>		
Overhead	= 60% of the Sum of Total Labor + Materials	\$32,029
Administrative	= 2% of Total Capital Investment	
Property Tax	= 1% of Total Capital Investment	
Insurance	= 1% of Total Capital Investment	
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)	
	<b>Total IC =</b>	<b>\$410,864</b>
<b>TOTAL ANNUAL OPERATING COSTS =</b>		<b>\$23,836,001</b>

# HPA WET SCRUBBER

BASIS: Vendor Quotations, OAQPS Cost Manual (Sixth Edition)

COST ITEM	COST	TOTALS
<b><u>Direct Costs</u></b>		
<b>Purchased Equipment Costs: Scrubber</b>		
Scrubber (User Input Cost: Vendor Info)	\$870,000	
Ancillary Equipment	\$130,500	N/A
	<b>Sum = "A" =</b>	<b>\$1,000,500</b>
Instrumentation (0.10 * A)	\$90,045	
Sales Taxes (0.03 * A)	\$50,025	
Freight (0.05 * A)	\$80,040	
	<b>Purchased Equipment Cost = "B" =</b>	<b>\$1,220,610</b>
<b><u>Direct Installation Costs</u></b>		
Foundation and Supports (0.12 * B)	\$146,473	
Handling and Erection (0.40 * B)	\$488,244	
Electrical (0.01 * B)	\$12,206	
Piping, Ductwork, and Installation (0.30 * B)	\$366,183	
Insulation (0.01 * B)	\$12,206	
Painting (0.01 * B)	\$12,206	
	<b>Direct Installation Cost =</b>	<b>\$1,037,519</b>
Site Preparation (User Inputs Actual Cost)	\$150,000	
Facilities and Buildings (User Inputs Actual Cost)	\$25,000	
	<b>Total Direct Cost =</b>	<b>\$2,433,129</b>
<b><u>Indirect Cost (Installation)</u></b>		
Engineering (0.10 * B)	\$122,061	
Construction and Field Expenses (0.10 * B)	\$122,061	
Contractor Fees (0.10 * B)	\$122,061	
Start-Up (0.01 * B)	\$12,206	
Performance Test (0.01 * B)	\$12,206	
Contingencies (0.03 * B)	\$36,618	
	<b>Total Indirect Cost =</b>	<b>\$427,214</b>
<b>TOTAL CAPITAL INVESTMENT =</b>		<b>\$2,860,342</b>
<b><u>Direct Annual Costs (DC)</u></b>		
<b><u>Operating Labor</u></b>		
<b>(Basis of Calculations)</b>		
Operator = (hr/shift * shifts/day * days/yr * \$/hr)	0.50	\$16,425
Supervisor = (15% of Operator Cost)		\$2,464
Operating Materials (If Any)		\$0
Maintenance Labor = (hr/shift * shifts/day * days/yr * \$/hr)	0.50	\$16,425
Maintenance Materials = 100% of Maintenance Labor		\$16,425
Replacement Labor (Actual Cost Per User)		\$0
Parts Cost (5% of Purchased Cost)		\$0
<b><u>Utilities:</u></b>		
Electricity = \$/kWhr * hp * 1 kWhr/1.341 hp * 8760 hr/yr	130	\$49,114
Water = \$/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	93	\$129,940
Wastewater = \$/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	93	\$160,600
Caustic = lb/hr caustic * \$/lb*8760	433	\$1,175,695
	<b>Total DC =</b>	<b>\$1,567,088</b>
<b><u>Indirect Annual Costs (IC)</u></b>		
Overhead = 60% of the Sum of Total Labor	\$51,739	\$31,043
Administrative = 2% of Total Capital Investment		\$57,207
Property Tax = 1% of Total Capital Investment		\$28,603
Insurance = 1% of Total Capital Investment		\$28,603
Capital Recovery (Based on 8% & 20 year life: Factor = 0.10185)		\$291,326
	<b>Total IC =</b>	<b>\$436,783</b>
<b>TOTAL ANNUAL OPERATING COSTS =</b>		<b>\$2,003,871</b>

HPA CARBON ADSORPTION/THERMAL OXIDIZER/SCRUBBER  
BASIS: Vendor Quotations, OAQPS Cost Manual (Sixth Edition)

COST ITEM	COST	TOTALS
<b>Direct Costs</b>		
<b>Purchased Equipment Costs: Carbon Adsorber</b>		
Adsorber (User Input Cost: QAQPS Info)	\$215,000	N/A
Ancillary Equipment	\$53,750	
Thermal oxidizer	\$435,000	
Ancillary Equipment	\$108,750	
Bromine Scrubber	\$270,000	
Ancillary Equipment	\$40,500	
	<b>Sum = "A" =</b>	<b>\$1,123,000</b>
Instrumentation (0.10 * A)	\$112,300	
Sales Taxes (0.03 * A)	\$33,690	
Freight (0.05 * A)	\$56,150	
	<b>Purchased Equipment Cost = "B" =</b>	<b>\$1,325,140</b>
<b>Direct Installation Costs</b>		
Foundation and Supports (0.08 * B)	\$106,011	
Handling and Errection (0.14 * B)	\$185,520	
Electrical (0.04 * B)	\$53,006	
Piping, Ductwork, and Installation (0.02 * B)	\$26,503	
Insulation for Ductwork (0.01 * B)	\$13,251	
Painting (0.02 * B)	\$26,503	
	<b>Direct Installation Cost =</b>	<b>\$410,793</b>
Site Preparation (User Inputs Actual Cost)	\$150,000	
Facilities and Buildings (User Inputs Actual Cost)	\$25,000	
	<b>Total Direct Cost =</b>	<b>\$1,910,933</b>
<b>Indirect Cost (Installation)</b>		
Engineering (0.10 * B)	\$132,514	
Construction and Field Expenses (0.05 * B)	\$66,257	
Contractor Fees (0.10 * B)	\$132,514	
Start-Up (0.02 * B)	\$26,503	
Performance Test (0.01 * B)	\$13,251	
Contingencies (0.03 * B)	\$39,754	
	<b>Total Indirect Cost =</b>	<b>\$410,793</b>
<b>TOTAL CAPITAL INVESTMENT =</b>		<b>\$2,321,727</b>
<b>Direct Annual Costs (DC)</b>		
<b>Operating Labor</b>		
<b>(Basis of Calculations)</b>		
Operator = (hr/shift * shifts/day * days/yr * \$/hr)	0.50	\$16,425
Supervisor = (15% of Operator Cost)		\$2,464
Operating Materials (If Any)		\$0
Maintenance Labor = (hr/shift * shifts/day * days/yr * \$/hr)	0.50	\$16,425
Maintenance Materials = 100% of Maintenance Labor		\$16,425
Replacement Labor (Actual Cost Per User)		\$0
Parts Cost (5% of Purchased Cost)		\$0
<b>Utilities:</b>		
Replacement Carbon	3,416,400	\$3,416,400
Solid waste disposal = \$/ton * lbs/yr/2000	1708	\$177,653
Steam = 4.0 lbs steam/lb Organic adsorbed * \$/lb	5,124,600	\$118,891
Fuel (natural gas) (cfm/1000 * \$/1000 cf * 60 min/hr * 8760 hr/yr)	580.0	\$94,503
Electricity = \$/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	45	\$293,960
Water = \$/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	40	\$56,134
Wastewater = \$/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	40	\$69,379
Sodium Formate =lb/hr * \$/lb * 8760 hr/yr	40.0	\$108,624
	<b>Total DC =</b>	<b>\$4,387,282</b>
<b>Indirect Annual Costs (IC)</b>		
Overhead = 60% of the Sum of Total Labor	\$51,739	\$31,043
Administrative = 2% of Total Capital Investment		\$46,435
Property Tax = 1% of Total Capital Investment		\$23,217
Insurance = 1% of Total Capital Investment		\$23,217
Capital Recovery (Based on 8% & 20 year life: Factor = 0.10185)		\$236,468
	<b>Total IC =</b>	<b>\$360,380</b>
<b>TOTAL ANNUAL OPERATING COSTS =</b>		<b>\$4,747,662</b>

# HPA REFRIGERATED CONDENSER SYSTEM/BROMINE SCRUBBER

BASIS: Vendor Quotations, OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
<b>Direct Costs</b>			
<b>Purchased Equipment Costs: Refrigerated Condenser System</b>			
Condenser (User Input Cost: QAQPS Info)		\$850,000	N/A
Ancillary Equipment		\$212,500	
VOC Storage		\$100,000	
Bromine Scrubber		\$270,000	
Ancillary Equipment		\$40,500	
	<b>Sum = "A" =</b>		<b>\$1,473,000</b>
Instrumentation (0.10 * A)		\$147,300	
Sales Taxes (0.03 * A)		\$44,190	
Freight (0.05 * A)		\$73,650	
	<b>Purchased Equipment Cost = "B" =</b>		<b>\$1,738,140</b>
<b>Direct Installation Costs</b>			
Foundation and Supports (0.08 * B)		\$139,051	
Handling and Erection (0.14 * B)		\$243,340	
Electrical (0.04 * B)		\$69,526	
Piping, Ductwork, and Installation (0.02 * B)		\$34,763	
Insulation for Ductwork (0.01 * B)		\$17,381	
Painting (0.02 * B)		\$34,763	
	<b>Direct Installation Cost =</b>		<b>\$538,823</b>
Site Preparation (User Inputs Actual Cost)		\$150,000	
Facilities and Buildings (User Inputs Actual Cost)		\$25,000	
	<b>Total Direct Cost =</b>		<b>\$2,451,963</b>
<b>Indirect Cost (Installation)</b>			
Engineering (0.10 * B)		\$173,814	
Construction and Field Expenses (0.05 * B)		\$86,907	
Contractor Fees (0.10 * B)		\$173,814	
Start-Up (0.02 * B)		\$34,763	
Performance Test (0.01 * B)		\$17,381	
Contingencies (0.03 * B)		\$52,144	
	<b>Total Indirect Cost =</b>		<b>\$538,823</b>
<b>TOTAL CAPITAL INVESTMENT =</b>			<b>\$2,990,787</b>
<b>Direct Annual Costs (DC)</b>			
<b>Operating Labor</b>		<b>(Basis of Calculations)</b>	
Operator	= (hr/shift * shifts/day * days/yr * \$/hr)	0.50	\$16,425
Supervisor	= (15% of Operator Cost)		\$2,464
Operating Materials	(If Any)		\$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * \$/hr)	0.20	\$6,570
Maintenance Materials	= 100% of Maintenance Labor		\$6,570
Replacement Labor	(Actual Cost Per User)		\$0
Parts Cost	(5% of Purchased Cost)		\$0
<b>Utilities:</b>			
Liquid Waste Disposal	= \$/lb * lb/hr * 8760 hr/yr	300	\$394,200
Electricity	= \$/kWhr * hp * 1 kWhr/1.341 hp * 8760 hr/yr	45	\$17,050
Water	= \$/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	40	\$56,134
Wastewater	= \$/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	45	\$78,052
Caustic	= lb/hr caustic * \$/lb * 8760	40	\$108,624
	<b>Total DC =</b>		<b>\$686,088</b>
<b>Indirect Annual Costs (IC)</b>			
Overhead	= 60% of the Sum of Total Labor	\$32,029	\$19,217
Administrative	= 2% of Total Capital Investment		\$59,816
Property Tax	= 1% of Total Capital Investment		\$29,908
Insurance	= 1% of Total Capital Investment		\$29,908
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		\$304,612
	<b>Total IC =</b>		<b>\$443,460</b>
<b>TOTAL ANNUAL OPERATING COSTS =</b>			<b>\$1,129,548</b>
<b>Carrier Gas Addition - Nitrogen</b>			
Nitrogen for carrier	\$/1000 scf * scfm carrier gas * 60 min/hr * 8760 hr/yr	20,000	<b>\$17,082,000</b>

**VENT SCRUBBER VOC COST TABLES**  
**VENT SCRUBBER THERMAL OXIDIZER**  
BASIS: Vendor Quotations, OAQPS Cost Manual (Sixth Edition)

COST ITEM	COST	TOTALS
<b><u>Direct Costs</u></b>		
<b>Purchased Equipment Costs: One 25,000 acfm TO Unit</b>		
Thermal Oxidizer (Input Cost: Vendor Info and QAQPS USEPA Factor)	\$500,000	N/A
Ancillary Equipment	\$75,000	
Fan	\$25,000	
Ancillary Equipment	\$3,750	
	<b>Sum = "A" =</b>	<b>\$603,750</b>
Instrumentation (0.10 * A)	\$60,375	
Sales Taxes (0.03 * A)	\$18,113	
Freight (0.05 * A)	\$30,188	
	<b>Purchased Equipment Cost = "B" =</b>	<b>\$712,425</b>
<b><u>Direct Installation Costs</u></b>		
Foundation and Supports (0.08 * B)	\$56,994	
Handling and Erection (0.14 * B)	\$99,740	
Electrical (0.04 * B)	\$28,497	
Piping, Ductwork, and Installation (0.02 * B)	\$14,249	
Insulation for Ductwork (0.01 * B)	\$7,124	
Painting (0.01 * B)	\$7,124	
	<b>Direct Installation Cost =</b>	<b>\$213,728</b>
Site Preparation (User Inputs Actual Cost)	\$150,000	
Facilities and Buildings (User Inputs Actual Cost)	\$25,000	
	<b>Total Direct Cost =</b>	<b>\$1,101,153</b>
<b><u>Indirect Cost (Installation)</u></b>		
Engineering (0.10 * B)	\$71,243	
Construction and Field Expenses (0.05 * B)	\$35,621	
Contractor Fees (0.10 * B)	\$71,243	
Start-Up (0.02 * B)	\$14,249	
Performance Test (0.01 * B)	\$7,124	
Contingencies (0.03 * B)	\$21,373	
	<b>Total Indirect Cost =</b>	<b>\$220,852</b>
<b>TOTAL CAPITAL INVESTMENT =</b>		<b>\$1,322,004</b>
<b><u>Direct Annual Costs (DC)</u></b>		
<b><u>Operating Labor</u></b>		
Operator	<b>(Basis of Calculations)</b> = (hr/shift * shifts/day * days/yr * \$/hr)	0.5
Supervisor	= (15% of Operator Cost)	
Operating Materials	(If Any)	
Maintenance Labor	= (hr/shift * shifts/day * days/yr * \$/hr)	0.5
Maintenance Materials	= 100% of Maintenance Labor	
Replacement Labor	N/A	
Parts Cost	N/A	
<b><u>Utilities:</u></b>		
Fuel (natural gas)	(cfm/1000 * \$/1000 cf * 60 min/hr * 8760 hr/yr)	536.9
Electricity	= \$/kWhr * hp * 1 kWhr/1.341 hp * 8760 hr/yr	31.5
	<b>Total DC =</b>	<b>\$1,031,355</b>
<b><u>Indirect Annual Costs (IC)</u></b>		
Overhead	= 60% of the Sum of Total Labor + Materials	\$48,728
Administrative	= 2% of Total Capital Investment	
Property Tax	= 1% of Total Capital Investment	
Insurance	= 1% of Total Capital Investment	
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)	
	<b>Total IC =</b>	<b>\$216,763</b>
<b>TOTAL ANNUAL OPERATING COSTS =</b>		<b>\$1,248,118</b>



**VENT SCRUBBER CATALYTIC THERMAL OXIDIZER**  
**BASIS: Vendor Quotations, OAQPS Cost Manual (Sixth Edition)**

COST ITEM	COST	TOTALS
<b><u>Direct Costs</u></b>		
<b>Purchased Equipment Costs: One 25,000 acfm CTO Unit</b>		
Thermal Oxidizer (User Input Cost: Vendor Info and QAQPS USEPA Factor)	\$ 1,000,000	N/A
Ancillary Equipment	\$150,000	
Fan	\$25,000	
Ancillary Equipment	\$3,750	
	<b>Sum = "A" =</b>	<b>\$ 1,178,750.00</b>
Instrumentation (0.10 * A)	\$117,875	
Sales Taxes (0.03 * A)	\$35,363	
Freight (0.05 * A)	\$58,938	
	<b>Purchased Equipment Cost = "B" =</b>	<b>\$1,390,925</b>
<b><u>Direct Installation Costs</u></b>		
Foundation and Supports (0.08 * B)	\$111,274	
Handling and Erection (0.14 * B)	\$194,730	
Electrical (0.04 * B)	\$55,637	
Piping, Ductwork and Installation (0.02 * B)	\$27,819	
Insulation for Ductwork (0.01 * B)	\$13,909	
Painting (0.01 * B)	\$13,909	
	<b>Direct Installation Cost =</b>	<b>\$417,278</b>
Site Preparation (User Inputs Actual Cost)	\$150,000	
Facilities and Buildings (User Inputs Actual Cost)	\$25,000	
	<b>Total Direct Cost =</b>	<b>\$1,983,203</b>
<b><u>Indirect Cost (Installation)</u></b>		
Engineering (0.10 * B)	\$139,093	
Construction and Field Expenses (0.05 * B)	\$69,546	
Contractor Fees (0.10 * B)	\$139,093	
Start-Up (0.02 * B)	\$27,819	
Performance Test (0.01 * B)	\$13,909	
Contingencies (0.03 * B)	\$41,728	
	<b>Total Indirect Cost =</b>	<b>\$431,187</b>
<b>TOTAL CAPITAL INVESTMENT =</b>		<b>\$2,414,389</b>
<b><u>Direct Annual Costs (DC)</u></b>		
<b><u>Operating Labor</u></b>		
<b>(Basis of Calculations)</b>		
Operator	= (hr/shift * shifts/day * days/yr * \$/hr) 0.5	\$14,600
Supervisor	= (15% of Operator Cost)	\$2,190
Operating Materials	(If Any)	\$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * \$/hr) 0.5	\$14,600
Maintenance Materials	= 100% of Maintenance Labor	\$14,600
Replacement Labor	N/A	\$0
Catalyst Cost	= CF cat * \$850/CF * 1 @ 2 years 20	\$8,500
<b><u>Utilities:</u></b>		
Fuel (natural gas)	(cfm/1000 * \$/1000 cf * 60 min/hr * 8760 hr/yr) 179.0	\$615,609
Electricity	= \$/kWhr * hp * 1 kWhr/1.341 hp * 8760 hr/yr 31.5	\$11,935
	<b>Total DC =</b>	<b>\$682,034</b>
<b><u>Indirect Annual Costs (IC)</u></b>		
Overhead	= 60% of the Sum of Total Labor + Materials \$45,990	\$27,594
Administrative	= 2% of Total Capital Investment	\$48,288
Property Tax	= 1% of Total Capital Investment	\$24,144
Insurance	= 1% of Total Capital Investment	\$24,144
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)	\$245,906
	<b>Total IC =</b>	<b>\$370,075</b>
<b>TOTAL ANNUAL OPERATING COSTS =</b>		<b>\$1,052,109</b>

**VENT SCRUBBER REGENERATIVE THERMAL OXIDIZER**  
**BASIS: Vendor Quotations, OAQPS Cost Manual (Sixth Edition)**

COST ITEM	COST	TOTALS
<b><u>Direct Costs</u></b>		
<b><u>Purchased Equipment Costs</u></b>		
Thermal Oxidizer (User Input Cost: Vendor Info and QAQPS USEPA Factor)	560,000	N/A
Ancillary Equipment	\$84,000	
Fan	\$25,000	
Ancillary Equipment	\$3,750	
	<b>Sum = "A" =</b>	<b>672,750</b>
Instrumentation (0.10 * A)	\$67,275	
Sales Taxes (0.03 * A)	\$20,183	
Freight (0.05 * A)	\$33,638	
	<b>Purchased Equipment Cost = "B" =</b>	<b>\$793,845</b>
<b><u>Direct Installation Costs</u></b>		
Foundation and Supports (0.08 * B)	\$63,508	
Handling and Erection (0.14 * B)	\$111,138	
Electrical (0.04 * B)	\$31,754	
Piping, Ductwork, and Installation (0.02 * B)	\$15,877	
Insulation for Ductwork (0.01 * B)	\$7,938	
Painting (0.01 * B)	\$7,938	
	<b>Direct Installation Cost =</b>	<b>\$238,154</b>
Site Preparation (User Inputs Actual Cost)	\$150,000	
Facilities and Buildings (User Inputs Actual Cost)	\$25,000	
	<b>Total Direct Cost =</b>	<b>\$1,206,999</b>
<b><u>Indirect Cost (Installation)</u></b>		
Engineering (0.10 * B)	\$79,385	
Construction and Field Expenses (0.05 * B)	\$39,692	
Contractor Fees (0.10 * B)	\$79,385	
Start-Up (0.02 * B)	\$15,877	
Performance Test (0.01 * B)	\$7,938	
Contingencies (0.03 * B)	\$23,815	
	<b>Total Indirect Cost =</b>	<b>\$246,092</b>
<b>TOTAL CAPITAL INVESTMENT =</b>		<b>\$1,453,090</b>
<b><u>Direct Annual Costs (DC)</u></b>		
<b><u>Operating Labor</u></b>		
<b>(Basis of Calculations)</b>		
Operator	= (hr/shift * shifts/day * days/yr * \$/hr) 0.5	\$16,425
Supervisor	= (15% of Operator Cost)	\$2,464
Operating Materials	(If Any)	\$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * \$/hr) 0.5	\$16,425
Maintenance Materials	= 100% of Maintenance Labor	\$16,425
Replacement Labor	N/A	\$0
Parts Cost	N/A	\$0
<b><u>Utilities:</u></b>		
Fuel (natural gas)	(cfm/1000 * \$/1000 cf * 60 min/hr * 8760 hr/yr) 107.4	\$369,366
Electricity	= \$/kWhr * kWhr * 8760 hr/yr 80.0	\$40,646
Media Replacement	= CF media * \$50/CF / 3 years 750.0	\$12,500
	<b>Total DC =</b>	<b>\$474,251</b>
<b><u>Indirect Annual Costs (IC)</u></b>		
Overhead	= 60% of the Sum of Total Labor + Materials \$51,739	\$31,043
Administrative	= 2% of Total Capital Investment	\$29,062
Property Tax	= 1% of Total Capital Investment	\$14,531
Insurance	= 1% of Total Capital Investment	\$14,531
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)	\$147,997
	<b>Total IC =</b>	<b>\$237,164</b>
<b>TOTAL ANNUAL OPERATING COSTS =</b>		<b>\$711,415</b>



VENT SCRUBBER RECUPERATIVE THERMAL OXIDIZER  
BASIS: Vendor Quotations, OAQPS Cost Manual (Sixth Edition)

COST ITEM	COST	TOTALS
<b>Direct Costs</b>		
<u>Purchased Equipment Costs:</u>		
Thermal Oxidizer (User Input Cost: Vendor Info and QAQPS USEPA Factor)	\$960,000	N/A
Ancillary Equipment	\$144,000	
Fan	\$25,000	
Ancillary Equipment	\$3,750	
	<b>Sum = "A" =</b>	<b>\$1,132,750</b>
Instrumentation (0.10 * A)	\$113,275	
Sales Taxes (0.03 * A)	\$33,983	
Freight (0.05 * A)	\$56,638	
	<b>Purchased Equipment Cost = "B" =</b>	<b>\$1,336,645</b>
<b>Direct Installation Costs</b>		
Foundation and Supports (0.08 * B)	\$106,932	
Handling and Erection (0.14 * B)	\$187,130	
Electrical (0.04 * B)	\$53,466	
Piping, Ductwork, and Installation (0.02 * B)	\$26,733	
Insulation for Ductwork (0.01 * B)	\$13,366	
Painting (0.01 * B)	\$13,366	
	<b>Direct Installation Cost =</b>	<b>\$400,994</b>
Site Preparation (User Inputs Actual Cost)	\$150,000	
Facilities and Buildings (User Inputs Actual Cost)	\$25,000	
	<b>Total Direct Cost =</b>	<b>\$1,912,639</b>
<b>Indirect Cost (Installation)</b>		
Engineering (0.10 * B)	\$133,665	
Construction and Field Expenses (0.05 * B)	\$66,832	
Contractor Fees (0.10 * B)	\$133,665	
Start-Up (0.02 * B)	\$26,733	
Performance Test (0.01 * B)	\$13,366	
Contingencies (0.03 * B)	\$40,099	
	<b>Total Indirect Cost =</b>	<b>\$414,360</b>
<b>TOTAL CAPITAL INVESTMENT =</b>		<b>\$2,326,998</b>
<b>Direct Annual Costs (DC)</b>		
<u>Operating Labor</u>		
	<b>(Basis of Calculations)</b>	
Operator	= (hr/shift * shifts/day * days/yr * \$/hr) 0.5	\$16,425
Supervisor	= (15% of Operator Cost)	\$2,464
Operating Materials	(If Any)	\$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * \$/hr) 0.5	\$16,425
Maintenance Materials	= 100% of Maintenance Labor	\$16,425
Replacement Labor	N/A	\$0
Parts Cost	N/A	\$0
<u>Utilities:</u>		
Fuel (natural gas)	(cfm/1000 * \$/1000 cf * 60 min/hr * 8760 hr/yr) 268.4	\$923,414
Electricity	= \$/kWhr * hp * 1 kWhr/1.341 hp * 8760 hr/yr 26.0	\$9,851
	<b>Total DC =</b>	<b>\$985,003</b>
<b>Indirect Annual Costs (IC)</b>		
Overhead	= 60% of the Sum of Total Labor + Materials \$51,739	\$31,043
Administrative	= 2% of Total Capital Investment	\$46,540
Property Tax	= 1% of Total Capital Investment	\$23,270
Insurance	= 1% of Total Capital Investment	\$23,270
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)	\$258,367
	<b>Total IC =</b>	<b>\$382,490</b>
<b>TOTAL ANNUAL OPERATING COSTS =</b>		<b>\$1,367,493</b>

# VENT SCRUBBER WET SCRUBBER

BASIS: Vendor Quotations, OAQPS Cost Manual (Sixth Edition)

COST ITEM	COST	TOTALS
<b><u>Direct Costs</u></b>		
<b><u>Purchased Equipment Costs: Scrubber</u></b>		
Scrubber (User Input Cost: Vendor Info)	\$470,000	N/A
Ancillary Equipment	\$70,500	
Fan	\$25,000	
Ancillary Equipment	\$3,750	
	<b>Sum = "A" =</b>	<b>\$569,250</b>
Instrumentation (0.10 * A)	\$51,233	
Sales Taxes (0.03 * A)	\$28,463	
Freight (0.05 * A)	\$45,540	
	<b>Purchased Equipment Cost = "B" =</b>	<b>\$694,485</b>
<b><u>Direct Installation Costs</u></b>		
Foundation and Supports (0.12 * B)	\$83,338	
Handling and Erection (0.40 * B)	\$277,794	
Electrical (0.01 * B)	\$6,945	
Piping, Ductwork, and Installation (0.30 * B)	\$208,346	
Insulation (0.01 * B)	\$6,945	
Painting (0.01 * B)	\$6,945	
	<b>Direct Installation Cost =</b>	<b>\$590,312</b>
Site Preparation (User Inputs Actual Cost)	\$150,000	
Facilities and Buildings (User Inputs Actual Cost)	\$25,000	
	<b>Total Direct Cost =</b>	<b>\$1,459,797</b>
<b><u>Indirect Cost (Installation)</u></b>		
Engineering (0.10 * B)	\$69,449	
Construction and Field Expenses (0.10 * B)	\$69,449	
Contractor Fees (0.10 * B)	\$69,449	
Start-Up (0.01 * B)	\$6,945	
Performance Test (0.01 * B)	\$6,945	
Contingencies (0.03 * B)	\$20,835	
	<b>Total Indirect Cost =</b>	<b>\$243,070</b>
<b>TOTAL CAPITAL INVESTMENT =</b>		<b>\$1,702,867</b>
<b><u>Direct Annual Costs (DC)</u></b>		
<b><u>Operating Labor</u></b>		
	<b><u>(Basis of Calculations)</u></b>	
Operator = (hr/shift * shifts/day * days/yr * \$/hr)	0.50	\$16,425
Supervisor = (15% of Operator Cost)		\$2,464
Operating Materials (If Any)		\$0
Maintenance Labor = (hr/shift * shifts/day * days/yr * \$/hr)	0.50	\$16,425
Maintenance Materials = 100% of Maintenance Labor		\$16,425
Replacement Labor (Actual Cost Per User)		\$0
Parts Cost (5% of Purchased Cost)		\$0
<b><u>Utilities:</u></b>		
Electricity = \$/kWhr * hp * 1 kWhr/1.341 hp * 8760 hr/yr	10	\$3,789
Water = \$/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	38	\$53,327
Wastewater = \$/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	38	\$65,910
Caustic = lb/hr * \$/lb * 8760 hr/yr	46.3	\$125,597
	<b>Total DC =</b>	<b>\$300,362</b>
<b><u>Indirect Annual Costs (IC)</u></b>		
Overhead = 60% of the Sum of Total Labor	\$51,739	\$31,043
Administrative = 2% of Total Capital Investment		\$34,057
Property Tax = 1% of Total Capital Investment		\$17,029
Insurance = 1% of Total Capital Investment		\$17,029
Capital Recovery (Based on 8% & 20 year life: Factor = 0.10185)		\$173,437
	<b>Total IC =</b>	<b>\$272,595</b>
<b>TOTAL ANNUAL OPERATING COSTS =</b>		<b>\$572,957</b>

**VENT SCRUBBER REFRIGERATED CONDENSER**  
**BASIS: Vendor Quotations, OAQPS Cost Manual (Sixth Edition)**

COST ITEM		COST	TOTALS
<b><u>Direct Costs</u></b>			
<b><u>Purchased Equipment Costs: Refrigerated Condenser</u></b>			
Condenser (User Input Cost: QAQPS Info)		\$219,000	
Ancillary Equipment		\$54,750	N/A
Fan		\$25,000	
Ancillary Equipment		\$3,750	
		<b>Sum = "A" =</b>	<b>\$302,500</b>
Instrumentation (0.10 * A)		\$30,250	
Sales Taxes (0.03 * A)		\$9,075	
Freight (0.05 * A)		\$15,125	
		<b>Purchased Equipment Cost = "B" =</b>	<b>\$356,950</b>
<b><u>Direct Installation Costs</u></b>			
Foundation & Supports (0.08 * B)		\$28,556	
Handling & Erection (0.14 * B)		\$49,973	
Electrical (0.04 * B)		\$14,278	
Piping, Ductwork & Installation (0.02 * B)		\$7,139	
Insulation for Ductwork (0.01 * B)		\$3,570	
Painting (0.02 * B)		\$7,139	
		<b>Direct Installation Cost =</b>	<b>\$110,655</b>
Site Preparation (User Inputs Actual Cost)		\$150,000	
Facilities & Buildings (User Inputs Actual Cost)		\$25,000	
		<b>Total Direct Cost =</b>	<b>\$642,605</b>
<b><u>Indirect Cost (Installation)</u></b>			
Engineering (0.10 * B)		\$35,695	
Construction & Field Expenses (0.05 * B)		\$17,848	
Contractor Fees (0.10 * B)		\$35,695	
Start-Up (0.02 * B)		\$7,139	
Performance Test (0.01 * B)		\$3,570	
Contingencies (0.03 * B)		\$10,709	
		<b>Total Indirect Cost =</b>	<b>\$110,655</b>
<b>TOTAL CAPITAL INVESTMENT =</b>			<b>\$753,259</b>
<b><u>Direct Annual Costs (DC)</u></b>			
<b><u>Operating Labor</u></b>		<b><u>(Basis of Calculations)</u></b>	
Operator	= (hr/shift * shifts/day * days/yr * \$/hr)	0.50	\$16,425
Supervisor	= (15% of Operator Cost)		\$2,464
Operating Materials	(If Any)		\$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * \$/hr)	0.20	\$6,570
Maintenance Materials	= 100% of Maintenance Labor		\$6,570
Replacement Labor	(Actual Cost Per User)		\$0
Parts Cost	(5% of Purchased Cost)		\$0
<b><u>Utilities:</u></b>			
Liquid Waste Disposal	= \$/lb * lb/hr * 8760 hr/yr	140	\$183,960
Electricity	= \$/kWhr * hp * 1 kWhr/1.341 hp * 8760 hr/yr	45	\$17,050
Wastewater	= \$/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	1	\$1,734
		<b>Total DC =</b>	<b>\$233,038</b>
<b><u>Indirect Annual Costs (IC)</u></b>			
Overhead	= 60% of the Sum of Total Labor	\$32,029	\$19,217
Administrative	= 2% of Total Capital Investment		\$15,065
Property Tax	= 1% of Total Capital Investment		\$7,533
Insurance	= 1% of Total Capital Investment		\$7,533
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		\$76,719
		<b>Total IC =</b>	<b>\$126,067</b>
<b>TOTAL ANNUAL OPERATING COSTS =</b>			<b>\$359,105</b>

# FUGITIVES VOC COST TABLES

## Existing LDAR Program

COST ITEM	COST	TOTALS
<b>Direct Annual Costs (DC)</b>		
<u>Operating Labor</u> <i>(Basis of Calculations)</i>		
LDAR Technician = (hrs/month * 12 * \$/hr)	120	\$64,800
Supervisor = (hrs/month * 12 * \$/hr)	10	\$7,800
Repairs Labor = (hrs/month * 12 * \$/hr)	3	\$1,620
Repairs Materials = 100% of Maintenance Labor		\$1,620
Total DC =		\$75,840
<b>TOTAL ANNUAL OPERATING COSTS =</b>		<b>\$75,840</b>

## Upgrade NSPS VV Portion to NSPS Vva

COST ITEM	COST	TOTALS
<b>Direct Annual Costs (DC)</b>		
<u>Operating Labor</u> <i>(Basis of Calculations)</i>		
LDAR Technician = (hrs/month * 12 * \$/hr)	135	\$72,900
Supervisor = (hrs/month * 12 * \$/hr)	10	\$7,800
Repairs Labor = (hrs/month * 12 * \$/hr)	8	\$4,320
Repairs Materials = 100% of Maintenance Labor		\$4,320
Total DC =		\$89,340
<b>TOTAL ANNUAL OPERATING COSTS =</b>		<b>\$89,340</b>

## Upgrade NSPS VV Portion to HON

COST ITEM	COST	TOTALS
<b>Direct Annual Costs (DC)</b>		
<u>Operating Labor</u> <i>(Basis of Calculations)</i>		
LDAR Technician = (hrs/month * 12 * \$/hr)	145	\$78,300
Supervisor = (hrs/month * 12 * \$/hr)	10	\$7,800
Repairs Labor = (hrs/month * 12 * \$/hr)	20	\$10,800
Repairs Materials = 100% of Maintenance Labor		\$10,800
Total DC =		\$107,700
<b>TOTAL ANNUAL OPERATING COSTS =</b>		<b>\$107,700</b>

**LPA CO COST TABLES**  
**LPA THERMAL OXIDIZER**  
BASIS: Vendor Quotations, OAQPS Cost Manual (Sixth Edition)

COST ITEM	COST	TOTALS
<b><u>Direct Costs</u></b>		
<b>Purchased Equipment Costs: One 2,500 acfm TO Unit</b>		
Thermal Oxidizer (Input Cost: Vendor Info and QAQPS USEPA Factor)	\$380,000	N/A
Ancillary Equipment	\$57,000	
Blower	\$30,000	
Ancillary Equipment	\$4,500	
	<b>Sum = "A" =</b>	<b>\$471,500</b>
Instrumentation (0.10 * A)	\$47,150	
Sales Taxes (0.03 * A)	\$14,145	
Freight (0.05 * A)	\$23,575	
	<b>Purchased Equipment Cost = "B" =</b>	<b>\$556,370</b>
<b><u>Direct Installation Costs</u></b>		
Foundation and Supports (0.08 * B)	\$44,510	
Handling and Erection (0.14 * B)	\$77,892	
Electrical (0.04 * B)	\$22,255	
Piping, Ductwork, and Installation (0.02 * B)	\$11,127	
Insulation for Ductwork (0.01 * B)	\$5,564	
Painting (0.01 * B)	\$5,564	
	<b>Direct Installation Cost =</b>	<b>\$166,911</b>
Site Preparation (User Inputs Actual Cost)	\$150,000	
Facilities and Buildings (User Inputs Actual Cost)	\$25,000	
	<b>Total Direct Cost =</b>	<b>\$898,281</b>
<b><u>Indirect Cost (Installation)</u></b>		
Engineering (0.10 * B)	\$55,637	
Construction and Field Expenses (0.05 * B)	\$27,819	
Contractor Fees (0.10 * B)	\$55,637	
Start-Up (0.02 * B)	\$11,127	
Performance Test (0.01 * B)	\$5,564	
Contingencies (0.03 * B)	\$16,691	
	<b>Total Indirect Cost =</b>	<b>\$172,475</b>
<b>TOTAL CAPITAL INVESTMENT =</b>		<b>\$1,070,756</b>
<b><u>Direct Annual Costs (DC)</u></b>		
<b><u>Operating Labor</u></b>		
Operator	<b>(Basis of Calculations)</b> = (hr/shift * shifts/day * days/yr * \$/hr) 0.5	\$32,850
Supervisor	= (15% of Operator Cost) (If Any)	\$4,928
Operating Materials		\$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * \$/hr) 0.5	\$5,475
Maintenance Materials	= 100% of Maintenance Labor	\$5,475
Replacement Labor	N/A	\$0
Parts Cost	N/A	\$0
<b><u>Utilities:</u></b>		
Fuel (natural gas)	(cfm/1000 * \$/1000 cf * 60 min/hr * 8760 hr/yr) 129.3	\$233,783
Electricity	= \$/kWhr * hp * 1 kWhr/1.341 hp * 8760 hr/yr 40.5	\$15,345
	<b>Total DC =</b>	<b>\$297,855</b>
<b><u>Indirect Annual Costs (IC)</u></b>		
Overhead	= 60% of the Sum of Total Labor + Materials \$48,728	\$29,237
Administrative	= 2% of Total Capital Investment	\$21,415
Property Tax	= 1% of Total Capital Investment	\$10,708
Insurance	= 1% of Total Capital Investment	\$10,708
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)	\$109,056
	<b>Total IC =</b>	<b>\$181,123</b>
<b>TOTAL ANNUAL OPERATING COSTS =</b>		<b>\$478,978</b>

LPA CATALYTIC THERMAL OXIDIZER  
BASIS: Vendor Quotations, OAQPS Cost Manual (Sixth Edition)

COST ITEM	COST	TOTALS
<b>Direct Costs</b>		
<b>Purchased Equipment Costs: One 2,500 acfm CTO Unit</b>		
Thermal Oxidizer (User Input Cost: Vendor Info and QAQPS USEPA Factor)	\$ 560,000	N/A
Ancillary Equipment	\$84,000	
Blower	\$30,000	
Ancillary Equipment	\$4,500	
	<b>Sum = "A" =</b>	<b>\$ 678,500.00</b>
Instrumentation (0.10 * A)	\$67,850	
Sales Taxes (0.03 * A)	\$20,355	
Freight (0.05 * A)	\$33,925	
	<b>Purchased Equipment Cost = "B" =</b>	<b>\$800,630</b>
<b>Direct Installation Costs</b>		
Foundation and Supports (0.08 * B)	\$64,050	
Handling and Errection (0.14 * B)	\$112,088	
Electrical (0.04 * B)	\$32,025	
Piping, Ductwork, and Installation (0.02 * B)	\$16,013	
Insulation for Ductwork (0.01 * B)	\$8,006	
Painting (0.01 * B)	\$8,006	
	<b>Direct Installation Cost =</b>	<b>\$240,189</b>
Site Preparation (User Inputs Actual Cost)	\$150,000	
Facilities and Buildings (User Inputs Actual Cost)	\$25,000	
	<b>Total Direct Cost =</b>	<b>\$1,215,819</b>
<b>Indirect Cost (Installation)</b>		
Engineering (0.10 * B)	\$80,063	
Construction and Field Expenses (0.05 * B)	\$40,032	
Contractor Fees (0.10 * B)	\$80,063	
Start-Up (0.02 * B)	\$16,013	
Performance Test (0.01 * B)	\$8,006	
Contingencies (0.03 * B)	\$24,019	
	<b>Total Indirect Cost =</b>	<b>\$248,195</b>
<b>TOTAL CAPITAL INVESTMENT =</b>		<b>\$1,464,014</b>
<b>Direct Annual Costs (DC)</b>		
<b>Operating Labor</b>		
<b>(Basis of Calculations)</b>		
Operator	= (hr/shift * shifts/day * days/yr * \$/hr) 0.5	\$14,600
Supervisor	= (15% of Operator Cost)	\$2,190
Operating Materials	(If Any)	\$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * \$/hr) 0.5	\$14,600
Maintenance Materials	= 100% of Maintenance Labor	\$14,600
Replacement Labor	N/A	\$0
Catalyst Cost	= CF cat * \$850/CF * 1 @ 2 years 30	\$12,750
<b>Utilities:</b>		
Fuel (natural gas)	(cfm/1000 * \$/1000 cf * 60 min/hr * 8760 hr/yr) 47.0	\$84,979
Electricity	= \$/kWhr * hp * 1 kWhr/1.341 hp * 8760 hr/yr 40.5	\$15,345
	<b>Total DC =</b>	<b>\$159,064</b>
<b>Indirect Annual Costs (IC)</b>		
Overhead	= 60% of the Sum of Total Labor + Materials \$45,990	\$27,594
Administrative	= 2% of Total Capital Investment	\$29,280
Property Tax	= 1% of Total Capital Investment	\$14,640
Insurance	= 1% of Total Capital Investment	\$14,640
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)	\$149,110
	<b>Total IC =</b>	<b>\$235,264</b>
<b>TOTAL ANNUAL OPERATING COSTS =</b>		<b>\$394,328</b>

LPA REGENERATIVE THERMAL OXIDIZER  
BASIS: Vendor Quotations, OAQPS Cost Manual (Sixth Edition)

COST ITEM	COST	TOTALS
<b>Direct Costs</b>		
<b>Purchased Equipment Costs</b>		
Thermal Oxidizer (User Input Cost: Vendor Info and QAQPS USEPA Factor)	430,000	N/A
Ancillary Equipment	\$64,500	
Blower	\$30,000	
Ancillary Equipment	\$4,500	
	<b>Sum = "A" =</b>	<b>529,000</b>
Instrumentation (0.10 * A)	\$52,900	
Sales Taxes (0.03 * A)	\$15,870	
Freight (0.05 * A)	\$26,450	
	<b>Purchased Equipment Cost = "B" =</b>	<b>\$624,220</b>
<b>Direct Installation Costs</b>		
Foundation and Supports (0.08 * B)	\$49,938	
Handling and Erection (0.14 * B)	\$87,391	
Electrical (0.04 * B)	\$24,969	
Piping, Ductwork, and Installation (0.02 * B)	\$12,484	
Insulation for Ductwork (0.01 * B)	\$6,242	
Painting (0.01 * B)	\$6,242	
	<b>Direct Installation Cost =</b>	<b>\$187,266</b>
Site Preparation (User Inputs Actual Cost)	\$150,000	
Facilities and Buildings (User Inputs Actual Cost)	\$25,000	
	<b>Total Direct Cost =</b>	<b>\$986,486</b>
<b>Indirect Cost (Installation)</b>		
Engineering (0.10 * B)	\$62,422	
Construction and Field Expenses (0.05 * B)	\$31,211	
Contractor Fees (0.10 * B)	\$62,422	
Start-Up (0.02 * B)	\$12,484	
Performance Test (0.01 * B)	\$6,242	
Contingencies (0.03 * B)	\$18,727	
	<b>Total Indirect Cost =</b>	<b>\$193,508</b>
<b>TOTAL CAPITAL INVESTMENT =</b>		<b>\$1,179,994</b>
<b>Direct Annual Costs (DC)</b>		
<b>Operating Labor</b>		
<b>(Basis of Calculations)</b>		
Operator	= (hr/shift * shifts/day * days/yr * \$/hr) 0.5	\$16,425
Supervisor	= (15% of Operator Cost)	\$2,464
Operating Materials	(If Any)	\$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * \$/hr) 0.5	\$16,425
Maintenance Materials	= 100% of Maintenance Labor	\$16,425
Replacement Labor	N/A	\$0
Parts Cost	N/A	\$0
<b>Utilities:</b>		
Fuel (natural gas)	(cfm/1000 * \$/1000 cf * 60 min/hr * 8760 hr/yr) 45.0	\$81,363
Electricity	= \$/kWhr * kWhr * 8760 hr/yr 48.0	\$24,388
Media Replacement	= CF media * \$50/CF / 2 years 400.0	\$10,000
	<b>Total DC =</b>	<b>\$167,489</b>
<b>Indirect Annual Costs (IC)</b>		
Overhead	= 60% of the Sum of Total Labor + Materials \$51,739	\$31,043
Administrative	= 2% of Total Capital Investment	\$23,600
Property Tax	= 1% of Total Capital Investment	\$11,800
Insurance	= 1% of Total Capital Investment	\$11,800
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)	\$120,182
	<b>Total IC =</b>	<b>\$198,425</b>
<b>TOTAL ANNUAL OPERATING COSTS =</b>		<b>\$365,915</b>



LPA RECUPERATIVE THERMAL OXIDIZER  
BASIS: Vendor Quotations, OAQPS Cost Manual (Sixth Edition)

COST ITEM	COST	TOTALS
<b><u>Direct Costs</u></b>		
<b><u>Purchased Equipment Costs:</u></b>		
Thermal Oxidizer (User Input Cost: Vendor Info and QAQPS USEPA Factor)	\$650,000	N/A
Ancillary Equipment	\$97,500	
Blower	\$30,000	
Ancillary Equipment	\$4,500	
	<b>Sum = "A" =</b>	<b>\$782,000</b>
Instrumentation (0.10 * A)	\$78,200	
Sales Taxes (0.03 * A)	\$23,460	
Freight (0.05 * A)	\$39,100	
	<b>Purchased Equipment Cost = "B" =</b>	<b>\$922,760</b>
<b><u>Direct Installation Costs</u></b>		
Foundation and Supports (0.08 * B)	\$73,821	
Handling and Erection (0.14 * B)	\$129,186	
Electrical (0.04 * B)	\$36,910	
Piping, Ductwork, and Installation (0.02 * B)	\$18,455	
Insulation for Ductwork (0.01 * B)	\$9,228	
Painting (0.01 * B)	\$9,228	
	<b>Direct Installation Cost =</b>	<b>\$276,828</b>
Site Preparation (User Inputs Actual Cost)	\$150,000	
Facilities and Buildings (User Inputs Actual Cost)	\$25,000	
	<b>Total Direct Cost =</b>	<b>\$1,374,588</b>
<b><u>Indirect Cost (Installation)</u></b>		
Engineering (0.10 * B)	\$92,276	
Construction and Field Expenses (0.05 * B)	\$46,138	
Contractor Fees (0.10 * B)	\$92,276	
Start-Up (0.02 * B)	\$18,455	
Performance Test (0.01 * B)	\$9,228	
Contingencies (0.03 * B)	\$27,683	
	<b>Total Indirect Cost =</b>	<b>\$286,056</b>
<b>TOTAL CAPITAL INVESTMENT =</b>		<b>\$1,660,644</b>
<b><u>Direct Annual Costs (DC)</u></b>		
<b><u>Operating Labor</u></b>		
<b>(Basis of Calculations)</b>		
Operator	= (hr/shift * shifts/day * days/yr * \$/hr) 0.5	\$16,425
Supervisor	= (15% of Operator Cost)	\$2,464
Operating Materials	(If Any)	\$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * \$/hr) 0.5	\$16,425
Maintenance Materials	= 100% of Maintenance Labor	\$16,425
Replacement Labor	N/A	\$0
Parts Cost	N/A	\$0
<b><u>Utilities:</u></b>		
Fuel (natural gas)	(cfm/1000 * \$/1000 cf * 60 min/hr * 8760 hr/yr) 53.0	\$95,827
Electricity	= \$/kWhr * hp * 1 kWhr/1.341 hp * 8760 hr/yr 40.0	\$15,155
	<b>Total DC =</b>	<b>\$162,721</b>
<b><u>Indirect Annual Costs (IC)</u></b>		
Overhead	= 60% of the Sum of Total Labor + Materials \$51,739	\$31,043
Administrative	= 2% of Total Capital Investment	\$33,213
Property Tax	= 1% of Total Capital Investment	\$16,606
Insurance	= 1% of Total Capital Investment	\$16,606
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)	\$258,367
	<b>Total IC =</b>	<b>\$355,836</b>
<b>TOTAL ANNUAL OPERATING COSTS =</b>		<b>\$518,557</b>



HPA CO COST TABLES  
HPA THERMAL OXIDIZER  
BASIS: Vendor Quotations, OAQPS Cost Manual (Sixth Edition)

COST ITEM	COST	TOTALS
<b>Direct Costs</b>		
<b>Purchased Equipment Costs: One 39,000 acfm TO Unit</b>		
Thermal Oxidizer (Input Cost: Vendor Info and QAQPS USEPA Factor)	\$720,000	N/A
Ancillary Equipment	\$108,000	
Bromine Scrubber	\$350,000	
Ancillary Equipment	\$52,500	
	<b>Sum = "A" =</b>	<b>\$1,230,500</b>
Instrumentation (0.10 * A)	\$123,050	
Sales Taxes (0.03 * A)	\$36,915	
Freight (0.05 * A)	\$61,525	
	<b>Purchased Equipment Cost = "B" =</b>	<b>\$1,451,990</b>
<b>Direct Installation Costs</b>		
Foundation and Supports (0.08 * B)	\$116,159	
Handling and Erection (0.14 * B)	\$203,279	
Electrical (0.04 * B)	\$58,080	
Piping, Ductwork, and Installation (0.02 * B)	\$29,040	
Insulation for Ductwork (0.01 * B)	\$14,520	
Painting (0.01 * B)	\$14,520	
	<b>Direct Installation Cost =</b>	<b>\$435,597</b>
Site Preparation (User Inputs Actual Cost)	\$150,000	
Facilities and Buildings (User Inputs Actual Cost)	\$25,000	
	<b>Total Direct Cost =</b>	<b>\$2,062,587</b>
<b>Indirect Cost (Installation)</b>		
Engineering (0.10 * B)	\$145,199	
Construction and Field Expenses (0.05 * B)	\$72,600	
Contractor Fees (0.10 * B)	\$145,199	
Start-Up (0.02 * B)	\$29,040	
Performance Test (0.01 * B)	\$14,520	
Contingencies (0.03 * B)	\$43,560	
	<b>Total Indirect Cost =</b>	<b>\$450,117</b>
<b>TOTAL CAPITAL INVESTMENT =</b>		<b>\$2,512,704</b>
<b>Direct Annual Costs (DC)</b>		
<b>Operating Labor</b>		
<b>(Basis of Calculations)</b>		
Operator	= (hr/shift * shifts/day * days/yr * \$/hr) 0.5	\$16,425
Supervisor	= (15% of Operator Cost)	\$2,464
Operating Materials	(If Any)	\$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * \$/hr) 0.2	\$6,570
Maintenance Materials	= 100% of Maintenance Labor	\$6,570
Replacement Labor	N/A	\$0
Parts Cost	N/A	\$0
<b>Utilities:</b>		
Fuel (natural gas)	(cfm/1000 * \$/1000 cf * 60 min/hr * 8760 hr/yr) 6425.9	\$11,618,422
Electricity	= \$/kWhr * hp * 1 kWhr/1.341 hp * 8760 hr/yr 127.0	\$48,125
Nitrogen for carrier	\$/1000 scf * scfm carrier gas * 60 min/hr * 8760 hr/yr 20000.0	\$17,082,000
Water	= \$/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr 76	\$106,551
Wastewater	= \$/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr 76	\$131,692
Caustic	= lb/hr caustic * \$/lb * 8760 55	\$149,358
	<b>Total DC =</b>	<b>\$29,168,177</b>
<b>Indirect Annual Costs (IC)</b>		
Overhead	= 60% of the Sum of Total Labor + Materials \$32,029	\$19,217
Administrative	= 2% of Total Capital Investment	\$50,254
Property Tax	= 1% of Total Capital Investment	\$25,127
Insurance	= 1% of Total Capital Investment	\$25,127
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)	\$255,919
	<b>Total IC =</b>	<b>\$375,644</b>
<b>TOTAL ANNUAL OPERATING COSTS =</b>		<b>\$29,543,821</b>

HPA EXISTING CATALYTIC THERMAL OXIDIZER  
BASIS: Vendor Quotations, OAQPS Cost Manual (Sixth Edition)

COST ITEM	COST	TOTALS
<b>Direct Costs</b>		
<u>Existing Unit - No construction necessary including bromine scrubber</u>		
Thermal Oxidizer (User Input Cost: Vendor Info and QAQPS USEPA Factor)	\$ -	
Ancillary Equipment	\$0	N/A
	<b>Sum = "A" =</b>	<b>\$0</b>
Instrumentation (0.10 * A)	\$0	
Sales Taxes (0.03 * A)	\$0	
Freight (0.05 * A)	\$0	
	<b>Purchased Equipment Cost = "B" =</b>	<b>\$0</b>
<b>Direct Installation Costs</b>		
Foundation and Supports (0.08 * B)	\$0	
Handling and Erection (0.14 * B)	\$0	
Electrical (0.04 * B)	\$0	
Piping, Ductwork, and Installation (0.02 * B)	\$0	
Insulation for Ductwork (0.01 * B)	\$0	
Painting (0.01 * B)	\$0	
	<b>Direct Installation Cost =</b>	<b>\$0</b>
Site Preparation (User Inputs Actual Cost)	\$0	
Facilities and Buildings (User Inputs Actual Cost)	\$0	
	<b>Total Direct Cost =</b>	<b>\$0</b>
<b>Indirect Cost (Installation)</b>		
Engineering (0.10 * B)	\$0	
Construction and Field Expenses (0.05 * B)	\$0	
Contractor Fees (0.10 * B)	\$0	
Start-Up (0.02 * B)	\$0	
Performance Test (0.01 * B)	\$0	
Contingencies (0.03 * B)	\$0	
	<b>Total Indirect Cost =</b>	<b>\$0</b>
<b>TOTAL CAPITAL INVESTMENT =</b>		<b>\$0</b>
<b>Direct Annual Costs (DC)</b>		
<u>Operating Labor</u>		
	<b>(Basis of Calculations)</b>	
Operator	= (hr/shift * shifts/day * days/yr * \$/hr) 0.5	\$16,425
Supervisor	= (15% of Operator Cost)	\$2,464
Operating Materials	(If Any)	\$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * \$/hr) 0.2	\$6,570
Maintenance Materials	= 100% of Maintenance Labor	\$6,570
Replacement Labor	N/A	\$0
Catalyst Cost	= CF cat * \$850/CF * 1 @ 2 years 20	\$8,500
<u>Utilities:</u>		
Fuel (natural gas)	(cfm/1000 * \$/1000 cf * 60 min/hr * 8760 hr/yr) 196.1	\$354,522
Electricity	= \$/kWhr * hp * 1 kWhr/1.341 hp * 8760 hr/yr 15.0	\$5,683
Wastewater	= \$/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr 15	\$26,017
Sodium Formate	= lb/hr * \$/lb * 8760 hr/yr 15.0	\$40,734
	<b>Total DC =</b>	<b>\$467,486</b>
<b>Indirect Annual Costs (IC)</b>		
Overhead	= 60% of the Sum of Total Labor + Materials \$32,029	\$19,217
Administrative	= 2% of Total Capital Investment	\$0
Property Tax	= 1% of Total Capital Investment	\$0
Insurance	= 1% of Total Capital Investment	\$0
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)	\$0
	<b>Total IC =</b>	<b>\$19,217</b>
<b>TOTAL ANNUAL OPERATING COSTS =</b>		<b>\$486,703</b>

# HPA REGENERATIVE THERMAL OXIDIZER/BROMINE SCRUBBER

BASIS: Vendor Quotations, OAQPS Cost Manual (Sixth Edition)

COST ITEM	COST	TOTALS
<b>Direct Costs</b>		
<b>Purchased Equipment Costs</b>		
Thermal Oxidizer (User Input Cost: Vendor Info and QAQPS USEPA Factor)	2,101,175	N/A
Ancillary Equipment	\$315,176	
Bromine Scrubber	\$350,000	
Ancillary Equipment	\$52,500	
	<b>Sum = "A" =</b>	<b>2,818,852</b>
Instrumentation (0.10 * A)	\$281,885	
Sales Taxes (0.03 * A)	\$84,566	
Freight (0.05 * A)	\$140,943	
	<b>Purchased Equipment Cost = "B" =</b>	<b>\$3,326,245</b>
<b>Direct Installation Costs</b>		
Foundation and Supports (0.08 * B)	\$266,100	
Handling and Erection (0.14 * B)	\$465,674	
Electrical (0.04 * B)	\$133,050	
Piping, Ductwork, and Installation (0.02 * B)	\$66,525	
Insulation for Ductwork (0.01 * B)	\$33,262	
Painting (0.01 * B)	\$33,262	
	<b>Direct Installation Cost =</b>	<b>\$997,874</b>
Site Preparation (User Inputs Actual Cost)	\$150,000	
Facilities and Buildings (User Inputs Actual Cost)	\$25,000	
	<b>Total Direct Cost =</b>	<b>\$4,499,119</b>
<b>Indirect Cost (Installation)</b>		
Engineering (0.10 * B)	\$332,625	
Construction and Field Expenses (0.05 * B)	\$166,312	
Contractor Fees (0.10 * B)	\$332,625	
Start-Up (0.02 * B)	\$66,525	
Performance Test (0.01 * B)	\$33,262	
Contingencies (0.03 * B)	\$99,787	
	<b>Total Indirect Cost =</b>	<b>\$1,031,136</b>
<b>TOTAL CAPITAL INVESTMENT =</b>		<b>\$5,530,255</b>
<b>Direct Annual Costs (DC)</b>		
<b>Operating Labor</b>		
<b>(Basis of Calculations)</b>		
Operator	= (hr/shift * shifts/day * days/yr * \$/hr) 0.5	\$16,425
Supervisor	= (15% of Operator Cost)	\$2,464
Operating Materials	(If Any)	\$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * \$/hr) 0.2	\$6,570
Maintenance Materials	= 100% of Maintenance Labor	\$6,570
Replacement Labor	N/A	\$0
Parts Cost	N/A	\$0
<b>Utilities:</b>		
Fuel (natural gas)	(cfm/1000 * \$/1000 cf * 60 min/hr * 8760 hr/yr) 642.6	\$1,161,842
Electricity	= \$/kWhr * kWhr * 8760 hr/yr 395.0	\$200,692
Nitrogen for carrier	\$/1000 scf * scfm carrier gas * 60 min/hr * 8760 hr/yr 20000.0	\$17,082,000
Water	= \$/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr 76	\$106,551
Wastewater	= \$/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr 76	\$131,692
Caustic	= lb/hr caustic * \$/lb * 8760 55	\$149,358
Media Replacement	= CF media * \$50/CF / 3 years 10000.0	\$166,667
	<b>Total DC =</b>	<b>\$19,030,830</b>
<b>Indirect Annual Costs (IC)</b>		
Overhead	= 60% of the Sum of Total Labor + Materials \$32,029	\$19,217
Administrative	= 2% of Total Capital Investment	\$110,605
Property Tax	= 1% of Total Capital Investment	\$55,303
Insurance	= 1% of Total Capital Investment	\$55,303
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)	\$418,691
	<b>Total IC =</b>	<b>\$659,119</b>
<b>TOTAL ANNUAL OPERATING COSTS =</b>		<b>\$19,689,949</b>

HPA RECUPERATIVE THERMAL OXIDIZER  
BASIS: Vendor Quotations, OAQPS Cost Manual (Sixth Edition)

COST ITEM	COST	TOTALS
<b>Direct Costs</b>		
<b>Purchased Equipment Costs:</b>		
Thermal Oxidizer (User Input Cost: Vendor Info and QAQPS USEPA Factor)	\$1,095,000	N/A
Ancillary Equipment	\$164,250	
Bromine Scrubber	\$350,000	
Ancillary Equipment	\$52,500	
	<b>Sum = "A" =</b>	<b>\$1,661,750</b>
Instrumentation (0.10 * A)	\$166,175	
Sales Taxes (0.03 * A)	\$49,853	
Freight (0.05 * A)	\$83,088	
	<b>Purchased Equipment Cost = "B" =</b>	<b>\$1,960,865</b>
<b>Direct Installation Costs</b>		
Foundation and Supports (0.08 * B)	\$156,869	
Handling and Erection (0.14 * B)	\$274,521	
Electrical (0.04 * B)	\$78,435	
Piping, Ductwork, and Installation (0.02 * B)	\$39,217	
Insulation for Ductwork (0.01 * B)	\$19,609	
Painting (0.01 * B)	\$19,609	
	<b>Direct Installation Cost =</b>	<b>\$588,260</b>
Site Preparation (User Inputs Actual Cost)	\$150,000	
Facilities and Buildings (User Inputs Actual Cost)	\$25,000	
	<b>Total Direct Cost =</b>	<b>\$2,724,125</b>
<b>Indirect Cost (Installation)</b>		
Engineering (0.10 * B)	\$196,087	
Construction and Field Expenses (0.05 * B)	\$98,043	
Contractor Fees (0.10 * B)	\$196,087	
Start-Up (0.02 * B)	\$39,217	
Performance Test (0.01 * B)	\$19,609	
Contingencies (0.03 * B)	\$58,826	
	<b>Total Indirect Cost =</b>	<b>\$607,868</b>
<b>TOTAL CAPITAL INVESTMENT =</b>		<b>\$3,331,993</b>
<b>Direct Annual Costs (DC)</b>		
<b>Operating Labor</b>		
<b>(Basis of Calculations)</b>		
Operator	= (hr/shift * shifts/day * days/yr * \$/hr) 0.5	\$16,425
Supervisor	= (15% of Operator Cost)	\$2,464
Operating Materials	(If Any)	\$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * \$/hr) 0.2	\$6,570
Maintenance Materials	= 100% of Maintenance Labor	\$6,570
Replacement Labor	N/A	\$0
Parts Cost	N/A	\$0
<b>Utilities:</b>		
Fuel (natural gas)	(cfm/1000 * \$/1000 cf * 60 min/hr * 8760 hr/yr) 3212.9	\$5,809,211
Electricity	= \$/kWhr * hp * 1 kWhr/1.341 hp * 8760 hr/yr 301.7	\$114,297
Nitrogen for carrier	\$/1000 scf * scfm carrier gas * 60 min/hr * 8760 hr/yr 20000.0	\$17,082,000
Water	= \$/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr 76	\$106,551
Wastewater	= \$/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr 76	\$131,692
Caustic	= lb/hr caustic * \$/lb * 8760 55	\$149,358
	<b>Total DC =</b>	<b>\$23,425,138</b>
<b>Indirect Annual Costs (IC)</b>		
Overhead	= 60% of the Sum of Total Labor + Materials \$32,029	\$19,217
Administrative	= 2% of Total Capital Investment	\$66,640
Property Tax	= 1% of Total Capital Investment	\$33,320
Insurance	= 1% of Total Capital Investment	\$33,320
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185) \$258,367	\$258,367
	<b>Total IC =</b>	<b>\$410,864</b>
<b>TOTAL ANNUAL OPERATING COSTS =</b>		<b>\$23,836,001</b>
<b>Carrier Gas Addition - Nitrogen</b>		
Nitrogen for carrier	\$/1000 scf * scfm carrier gas * 60 min/hr * 8760 hr/yr 20,000	<b>\$17,082,000</b>

# Appendix E

## Title V Permit Mark-up

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The Title V permit mark-up that follows has the requested changes for this PSD application highlighted in yellow. Any changes not highlighted in yellow were included in the Title V renewal application previously submitted but do not have to be implemented for this application.



## Part 70 Air Quality Permit

**BP Amoco Chemical Company-Cooper River Plant**  
**1306 Amoco Drive**  
**Wando, South Carolina 29492-7879**  
(Permit Updated 12/17/09)

In accordance with the provisions of the Pollution Control Act, Sections 48-1-50(5) and 48-1-110(a), and the 1976 Code of Laws of South Carolina, as amended, Regulation 61-62, the above named permittee is hereby granted permission to discharge air contaminants into the ambient air. The Bureau of Air Quality authorizes the operation of this facility and its applicable equipment specified herein in accordance with the plans, specifications and other information submitted in the Title V permit application dated December 17, 2003.

This permit is subject to and conditioned upon the terms, limitations, standards, and schedules contained in or specified on the 69 pages, with the accompanying attachments, of this permit.

**Permit Number: TV-0420-0029**  
**Issue Date: June 26, 2007**

**Effective Date: October 1, 2007**  
**Expiration Date: September 30, 2012**

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**Director, Engineering Services Division**  
**Bureau of Air Quality**

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## **PART 1.0 GENERAL INFORMATION**

### **A. APPLICABLE PERMIT DATES**

ISSUE DATE : June 26, 2007  
EFFECTIVE DATE : October 1, 2007  
EXPIRATION DATE : September 30, 2012

RENEWAL APPLICATION DUE : March 31, 2012

### **B. FACILITY INFORMATION**

**FEDERAL TAX IDENTIFICATION NO. : 36-2347240**

ENVIRONMENTAL CONTACT : Brent A. Pace  
CONTACT TELEPHONE NUMBER : (843) 881-5182  
INTERNET E-MAIL ADDRESS : brent.pace@bp.com  
FACILITY LOCATION : Highway 98 & Clements Ferry Road  
COUNTY : Berkeley  
SIC CODE(S) : 2869  
NAICS CODE(S) : 325199  
AFS CODE : 4501500029

### **C. FACILITY ADDRESS**

FACILITY NAME : BP Amoco Chemical Company-Cooper River Site  
ADDRESS : 1306 Amoco Drive  
CITY, STATE, ZIP : Wando, South Carolina 29492-7879

### **D. FACILITY BILLING ADDRESS**

FACILITY BILLING NAME : BP Amoco Chemical Company-Cooper River Site  
ADDRESS : 1306 Amoco Drive  
CITY, STATE, ZIP : Wando, South Carolina 29492-7879



## PART 5.0 EMISSION UNIT REQUIREMENTS

### A. EMISSION UNIT DESCRIPTION

Table 5.1 is a description of emission units located at this facility.

<b>TABLE 5.1 EMISSION UNITS</b>		
<b>Unit ID</b>	<b>Unit Description</b>	<b>Control Device Description</b>
01	Boiler #1 (242 Million Btu/hr) – <b>VOID</b> -	Dust Collection Hopper (Voluntary Control Device) – <b>VOID</b>
02	Boiler #2 (242 Million Btu/hr) – <b>VOID</b> -	Dust Collection Hopper (Voluntary Control Device) – <b>VOID</b>
03	Cooper River #1: Oxidation Unit	Scrubbers, Catalytic Oxidizer, Condenser
04	Cooper River # 1: PTA Unit	Baghouse, Scrubbers, Spray Nozzle
05	Cooper River #2: Oxidation Unit	Scrubbers, Catalytic Oxidizer, Condenser
06	Cooper River #2: PTA Unit	Baghouses, Scrubbers, Condenser
07	Shipping/Loading	Baghouses
08	Cooper River #1: Ox Four Compressors –VOID-	Low sulfur fuels –VOID-
09	Cooper River#2: Ox Emergency Generator (see Unit ID 11 below)	See Unit ID 11 below
10	CR#2 Utility Compressor #2 (see Unit ID 11 below)	See Unit ID 11 below
11	Utilities Generators, Compressors, and Pumps	N/A
12	Tank Farm	Internal Floating Roofs
13	Wastewater Treatment	<b>Boilers (for biogas)</b>
14	Waste Treatment Compressors	See Unit ID 11 above
15	Boiler #3 (Boiler AB-350A (390 Million Btu/hr))	Low <del>NOx</del> <b>NOx</b> Burners
16	Boiler #4 (Boiler AB-350B (390 Million Btu/hr))	Low <del>NOx</del> <b>NOx</b> Burners

N/A = Not Applicable

### B. CONTROL DEVICE DESCRIPTION

Table 5.2 is a description of control devices located at this facility.

<b>TABLE 5.2 CONTROL DEVICES</b>				
<b>Control Device ID</b>	<b>Unit ID</b>	<b>Control Device Description</b>	<b>Installation Date</b>	<b>Pollutant(s) Controlled</b>
301A (DC)	<del>(Unit ID-01)</del>	Dust Collection Hopper, Boiler #1(Voluntary Control Device) – <b>VOID</b> -	1977	Particulates
301B (DC)	<del>(Unit ID-02)</del>	Dust Collection Hopper, Boiler #2 (Voluntary Control Device) – <b>VOID</b> -	1977	Particulates
CR#1-HPVGT	<del>(Unit ID-03)</del>	High Pressure Vent Gas Treatment System (#1 Oxidation) (Consists of catalytic oxidizer and a scrubber)	1999	VOC, CO

**TABLE 5.2 CONTROL DEVICES**

<b>Control Device ID</b>	<b><u>Unit ID</u></b>	<b>Control Device Description</b>	<b>Installation Date</b>	<b>Pollutant(s) Controlled</b>
BT-603	<del>(Unit ID-03)</del>	Atmospheric Absorber	1977 2004 (Revision)	VOC
BM-504A	<del>(Unit ID-03)</del>	Bag Filters; Intermediate Storage – <b>VOID-</b>	1977	Particulates
BM-504B	<del>(Unit ID-03)</del>	Bag Filters; Intermediate Storage – <b>VOID-</b>	1977	Particulates
BT-501	<del>(Unit ID-03)</del>	Scrubber; Intermediate Storage	2002	Particulates
BH-522	<del>(Unit ID-03)</del>	Dry Cyclone Scrubber; Rotary Lock – <b>VOID-</b>	1983	Particulates
BE-645	<del>(Unit ID-03)</del>	Condenser (Recovery Device)	1977	VOC
CM-301	<del>(Unit ID-04)</del>	Venturi Scrubber; Crystallizer Vent Scrubber	1977	Particulates
CM-603A	<del>(Unit ID-04)</del>	Bag Filter; Day Silo	1977	Particulates
CM-603B	<del>(Unit ID-04)</del>	Bag Filter; Day Silo	1977	Particulates
CM-607A	<del>(Unit ID-04)</del>	Dust Collectors /Rotary Lock – <b>VOID-</b>	1991	Particulates
CM-607B	<del>(Unit ID-04)</del>	Dust Collectors/Rotary Lock– <b>VOID-</b>	1991	Particulates
CM-608A	<del>(Unit ID-04)</del>	Dust Collectors /Screener	1991	Particulates
CM-608B	<del>(Unit ID-04)</del>	Dust Collectors; Screener	1991	Particulates
CR#2-HPVGT	<del>(Unit ID-05)</del>	High Pressure Vent Gas Treatment System DR-1814/DT-1821 (Consists of catalytic oxidizer and a scrubber)	1996	HAP's, VOC, CO
DT-302	<del>(Unit ID-05)</del>	Atmospheric Absorber	1996	VOC
DT-500	<del>(Unit ID-04)</del>	Venturi Scrubber and Spray Tower; Ox Feed Silos	1996	Particulates
DE-416	<del>(Unit ID-05)</del>	Evaporator Overhead Condenser	1996	VOC
DM-601/DE-601	<del>(Unit ID-06)</del>	Venturi Scrubber and Spray Tower Crystallizer Vent Scrubber	1996	Particulates
DE-317	<del>(Unit ID-06)</del>	Mother Liquor Cooler Ejector Condenser	1996	VOC
DM-797A	<del>(Unit ID-06)</del>	Day Silo Dust Collector	1996	Particulates
DM-797B	<del>(Unit ID-06)</del>	Day Silo Dust Collector	1996	Particulates
CM-701A	<del>(Unit ID-07)</del>	Storage Silo Bag Filter	1977	Particulates
CM-701B	<del>(Unit ID-07)</del>	Storage Silo Bag Filter	1977	Particulates

<b>TABLE 5.2 CONTROL DEVICES</b>				
<b>Control Device ID</b>	<b>Unit ID</b>	<b>Control Device Description</b>	<b>Installation Date</b>	<b>Pollutant(s) Controlled</b>
CM-701C	<del>(Unit ID-07)</del>	Storage Silo Bag Filter	1977	Particulates
CM-701D	<del>(Unit ID-07)</del>	Storage Silo Bag Filter	1977	Particulates
CM-701E	<del>(Unit ID-07)</del>	Storage Silo Bag Filter	1977	Particulates
CM-720A (F Silo)	<del>(Unit ID-07)</del>	Storage Silo Bag Filter	1996	Particulates
CM-720B (F Silo)	<del>(Unit ID-07)</del>	Storage Silo Bag Filter	1996	Particulates
CM-722	<del>(Unit ID-07)</del>	Bulk Truck Loading Bag Filter	1996	Particulates
CM-705A	<del>(Unit ID-07)</del>	Loading Spout Dust Collector	1977	Particulates
CM-705B	<del>(Unit ID-07)</del>	Loading Spout Dust Collector	1977	Particulates
CM-705C	<del>(Unit ID-07)</del>	Loading Spout Dust Collector	1977	Particulates

### C. EQUIPMENT DESCRIPTION

A description of the equipment located at this facility is provided in the following tables:

<b>TABLE 5.3 UNIT ID 03 – Cooper River #1 Oxidation Unit</b>				
<b>Equip ID</b>	<b>Equipment Description</b>	<b>Installation Date</b>	<b>Control Device ID</b>	<b>Stack ID</b>
<del>BR-301</del> <del>A-D</del> <del>BR-301</del>	Reactors	<del>5/3/77</del> 2014	High Pressure Absorber (Recovery Device; BT-401) then to CR#1-HPVGT	O-2/10/15
<del>BD-401</del> 402	Crystallizers	5/3/77	High Pressure Absorber (Recovery Device; BT-401) then to CR#1-HPVGT	O-2/10/15
<del>BD-402</del> 403	Crystallizer	5/3/77	BT-601(Dryer Scrubber) then to BT-603 (Low Pressure Absorber)	O-3
BD-202	Solvent Charge	Modified 5/3/95	BT-603	O-3
BD-204	Feed Mix Drum	Modified 5/3/95	BT-603	O-3
BD-503	Filter Vacuum Pump Separator	Modified 5/3/95	BT-603	O-3
BD-602	Mother Liquor Drum	Modified 5/3/95	BT-603	O-3
BD-705	Dehydrated Solvent Drum (Bottom Receiver)	Modified 5/3/95	BT-603	O-3
BD-501	Filter	Modified 5/3/95	BT-603	O-3
BF-1401	Acetic Acid Tank	1977	BT-603	O-3

<b>TABLE 5.3 UNIT ID 03 – Cooper River #1 Oxidation Unit</b>				
<b>Equip ID</b>	<b>Equipment Description</b>	<b>Installation Date</b>	<b>Control Device ID</b>	<b>Stack ID</b>
BM-502	Ox Product Dryer	5/3/77	BT-603	O-3
<del>BT-701</del> <del>BE-706</del>	Dehydration Tower	Modified 5/3/95 and 2004 & 2011 & 2014	DHT Scrubber (HON Recovery Device & Control) Control Device ID (BT-702) BT-603 (HON Recovery Device)	<del>O-23</del> <del>O-3</del>
<del>BT-701</del> <del>BE-706</del>	Dehydration Tower	Modified 5/3/95 and 2004	CR#1 HPVGTS	<del>O-2</del> <del>O-15</del>
BF-501A	Intermediate Storage Silo -VOID-	5/23/77	BM-504A-VOID	O-7
BF-501B	Intermediate Storage Silo -VOID-	5/23/77	BM-504B-VOID	O-8
BF-501A	Intermediate Storage Silo	2002	BT-501	O-22
BF-501B	Intermediate Storage Silo	2002	BT-501	O-22
BM-1101 A/B	Off Gas Dryer (Emission Point for BT-401)	Modified 5/3/95	None	O-10
BD-625	CRU Extraction Drum	8/7/80	None	O-11
BD-631	CRU Mother Liquor Drum	8/7/80	None	O-12
BD-632	CRU Waste Solids Reslurry Drum	1983	None	O-13
BH-523	Dryer Rotary Lock Venting System (Fluidizer) -VOID-	1983	BH-522(VOID)	O-14
BM-1101C/D	Off Gas Dryer (Emission Point for B-401)	2/1/85	None	O-15
<del>BD-640</del>	CRU Evaporator	8/7/80	<del>BE-645</del>	<del>O-16</del>
BM-1201	Emergency Generator #2	5/23/77	None	O-17

The CR#1 Dehydration Tower is a HON Group 2 stream, with a TRE between 1 and 4, after the ~~DHT Scrubber~~ Low Pressure Absorber (HON Recovery Device). ~~The DHT Scrubber outlet will normally go via the LPVGT system to the CR#1 HPVGTS. However, the DHT Scrubber can vent to the atmosphere (Vent O-23) per the emission limitations from construction permit 0420-0029-CR.~~

<b>TABLE 5.4 UNIT ID 04 – Cooper River #1:PTA Unit</b>				
<b>Equip ID</b>	<b>Equipment Description</b>	<b>Installation Date</b>	<b>Control Device ID</b>	<b>Stack ID</b>
CD-101/CH-108	Feed Slurry Drum and Eductor	5/23/77	None	P-1
CD-413	Reslurry Solvent Drum	Modified 5/3/95	BT-603	O-3
CD-411	Mother Liquor Solids Reslurry Drum	Modified 5/3/95	BT-603	O-3
CD-301-303, CD-305	Crystallizers	5/23/77	CM-301	P-2
<del>CM-402A/B</del>	<del>Filters</del>	<del>2011</del>	<del>N/A</del>	<del>N/A</del>
CM-403A	Product Dryer and Vacuum System	5/23/77	None	P-3A
CM-403B	Product Dryer and Vacuum System	5/23/77	None	P-3B
CD-404A	Atmospheric Mother Liquor Flash Drum	5/23/77 Modified in 2005	CM-301	P-2
CR-202	Reactor	5/23/77	CM-301	P-2
CF-601A	Day Silo	5/23/77	CM-603A	P-4A
CF-601B	Day Silo	5/23/77	CM-603B	<del>P-5BP-4B</del>
CD-405	Filter Feed Drum and CH-418 Maintenance Spray	5/23/77	None	P-14

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<b>TABLE 5.4 UNIT ID 04 – Cooper River #1:PTA Unit</b>				
<b>Equip ID</b>	<b>Equipment Description</b>	<b>Installation Date</b>	<b>Control Device ID</b>	<b>Stack ID</b>
CM-609A	Product Screener A	1991	CM-608A	P-17
CM-609B	Product Screener B	1991	CM-608B	P-18
CH-430	Vacuum Ejector	8/7/80	None	P-19
CH-431	Hogger Vacuum Ejector	8/7/80	None	P-19
CD-412	Filtrate	8/7/80	None	P-19

<b>TABLE 5.5 UNIT ID 05 – Cooper River #2 Oxidation Unit</b>				
<b>Equip ID</b>	<b>Equipment Description</b>	<b>Installation Date</b>	<b>Control Device ID</b>	<b>Stack ID</b>
<del>O2-1</del> <del>DM-302</del>	Product Dryer	6/22/95	DT-302	O2-1
DD-303	TA Filter Feed Drum-Vacuum Pump KO Drum	6/22/95	DT-302	O2-1
DD-306	Mother Liquor Drum	6/22/95	DT-302	O2-1
DD-405	Dehydrated Solvent Drum	6/22/95	DT-302	O2-1
DD- <del>202/203</del>	Crystallizers <del>Condenser</del>	6/22/95	DT-302	O2-1
DD-307	Slurry Surge Drum	6/22/95	DT-302	O2-1
DD-103	Catalyst Charge Drum	6/22/95	DT-302	O2-1
DE-110	Feed Mix Drum Vent Condenser	6/22/95	DT-302	O2-1
DE-204	Crystallizer Overhead Ejector Condenser	6/22/95	DT-302	O2-1
DD-305	Filter Cake Reslurry Drum	6/22/95	DT-302	O2-1
DT-111	High Pressure Absorber**	6/22/95	CR#2-HPVGT	O2-3/4
DB-1813	HPVGT Fired Heater	6/22/95	None	O2-2
<b>DT-403</b>	<b>Dehydration Tower</b>	<b>6/22/952014</b>	<b>CR#2-HPVGT DT-302 (HON Recovery Device)</b>	<b>O2-3/4 O2-1</b>
DR-106 A/B	Reactors	6/22/95	CR#2-HPVGT	O2-3/4
DD-201	1 <sup>st</sup> Crystallizer	6/22/95	CR#2-HPVGT	O2-3/4
DF-500A/B	OX Feed Silos to PTA	6/22/95	DT-500	O2-5
<b>DD-412</b>	<b>CRU Extraction Drum</b>	<b>6/22/95</b>	<b>None</b>	<b>O2-6</b>
<b>DD-413</b>	<b>CRU Waste Slurry Drum</b>	<b>6/22/95</b>	<b>None</b>	<b>O2-7</b>
<b>DD-414</b>	<b>CRU Mother Liquor Drum</b>	<b>6/22/95</b>	<b>None</b>	<b>O2-8</b>
<b>DE-390</b>	<b>CRU Evaporation Drum</b>	<b>6/22/95</b>	<b>DE-416</b>	<b>O2-9</b>

**\*\*The CR#2 Dehydration tower is subject to the requirements of Sub part G of part 40 CFR 63. BP has elected to comply with Subpart G by first routing the dehydration Tower emissions through the HPA (recovery device) to the CR#2-HPVGTs, which is a HON Group 1 control device.**

<b>TABLE 5.6 UNIT ID 06 – Cooper River #2 PTA Unit</b>				
<b>Equip ID</b>	<b>Equipment Description</b>	<b>Installation Date</b>	<b>Control Device ID</b>	<b>Stack ID</b>
DD-500/ DH-518	Feed Slurry Drum and Eductor	6/22/95	None	P2-1
DD-601-605	Crystallizers	6/22/95	DM-601/DE-601	P2-2
DD-705	Filter Feed Drum	6/22/95	DM-601/DE-601	P2-2
DD-704	PRU Mother Liquor Flash Drum	6/22/95	DM-601/DE-601	P2-2
<b>DM-702A/B</b>	<b>Filters</b>	<b>2011</b>	<b>N/A</b>	<b>N/A</b>

<b>TABLE 5.6 UNIT ID 06 – Cooper River #2 PTA Unit</b>				
<b>Equip ID</b>	<b>Equipment Description</b>	<b>Installation Date</b>	<b>Control Device ID</b>	<b>Stack ID</b>
DM-703/ DM-704	Product Dryers and Vacuum System	6/22/95	None	P2-3
DF-703A	Day Silo	6/22/95	DM-797A	P2-4A
DF-703B	Day Silo	6/22/95	DM-797B	P2-4B
DM-798A	Product Screener	6/22/95	<del>DD-799</del> /DM-797A	P2-4A
DM-798B	Product Screener	6/22/95	<del>DD-799</del> /DM-797B	P2-4B
DD-304	PRU Mother Liquor Cooler	6/22/95	DE-317	P2-9
DD-308	PRU Mother Liquor Drum	6/22/95	None	P2-10
DR-500	Reactor	6/22/95	DM-601/DE-601	P2-2

<b>TABLE 5.7 UNIT ID 07 – Shipping/Loading</b>				
<b>Equip ID</b>	<b>Equipment Description</b>	<b>Installation Date</b>	<b>Control Device ID</b>	<b>Stack ID</b>
CP-701A-E	Product Loading Spout	5/03/77	CM-705A	SL-7
CP-701A-E	Product Loading Spout	5/03/77	CM-705B	SL-8
CP-701A-E	Product Loading Spout	5/03/77	CM-705C	SL-9
CF-701A	Shipping Storage Silo A	5/23/77	CM-701A	SL-1
CF-701B	Shipping Storage Silo B	5/23/77	CM-701B	SL-2
CF-701C	Shipping Storage Silo C	5/23/77	CM-701C	SL-3
CF-701D	Shipping Storage Silo D	5/23/77	CM-701D	SL-4
CF-701E	Shipping Storage Silo E	5/23/77	CM-701E	SL-5
CF-677	Intermediate Transfer Tank – <b>VOID-</b>	6/22/95	CM-677	SL-11
CF-701F	Shipping Storage Silo F	6/22/95	CM-720A	SL-6A
CF-701F	Shipping Storage Silo F	6/22/95	CM-720B	SL-6B
CP-701F/ 709F	Bulk Truck Loading	6/22/95	CM-722	SL-10

<b>TABLE 5.8 UNIT ID 11 – Utilities Generator, Compressor and Pumps</b>				
<b>Equip ID</b>	<b>Equipment Description</b>	<b>Installation Date</b>	<b>Control Device ID</b>	<b>Stack ID</b>
AM-804	Emergency Generator #1 (275 kW/0.136 Million Btu/hr)	<del>5/03/77</del> 1/1/79	None	U-3
AC-402	Emergency Compressor #1 ( <del>0.136</del> 1.53 Million Btu/hr)	5/03/77	None	U-4
AG-202B	Emergency Fire Water Pump ( <del>200.76</del> Million Btu/hr)	5/03/77, replaced 3/04	None	U-5
AC-404	Compressor #2 (8.2 Million Btu/hr)	1997	None	U-6
AG-229	T-Head FW Pump ( <del>4.0 Million Btu/hr</del> 224 BHP)	5/03/77	None	U-7
AM-838	IT Emergency Generator (5.5 Million Btu/hr)	2002	None	U-8
AG-202C	Emergency Fire Water Pump	200 <del>53</del>	None	U-9
AG-202D	Emergency Fire Water Pump	200 <del>53</del>	None	U-10
BM-1201	Emergency Generator #2	<del>5/03/77</del> 1/1/79	None	<del>U-11</del> 0-17
DM-135	Emergency Generator #3 (max 800 kW)	<del>1997</del> 12/11/95	None	<del>U-12</del> 02-10
L-1	(Leased) Compressor #1*	<del>1998</del> N/A	None	U-13
L-2	(Leased) Compressor #2*	<del>1998</del> N/A	None	U-14

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\* Total combined capacity of compressors shall be less than 2350 HP (5.98 Million Btu/hr)

<b>TABLE 5.9 UNIT ID 12 – Tank Farm</b>				
<b>Equip ID</b>	<b>Equipment Description</b>	<b>Installation Date</b>	<b>Control Device ID</b>	<b>Stack ID</b>
AF-101	Px Storage Tank (internal floating roof)	1977 (modified 10/92)	None	TK-1
AF-102	Px Storage Tank (internal floating roof)	1977 (modified 10/92)	None	TK-2
AF-103	Px Storage Tank (internal floating roof)	1977 (modified 10/92)	None	TK-6
	Px Unloading station	1977	None	N/A

<b>TABLE 5.10 UNIT ID 13 – Wastewater Treatment</b>				
<b>Equip ID</b>	<b>Equipment Description</b>	<b>Installation Date</b>	<b>Control Device ID</b>	<b>Stack ID</b>
AT-750	4 Million Gallon per day CO <sub>2</sub> Stripper	6/22/95	None	WT-10
AM-775	4 Million Gallon per day Anaerobic Reactor	6/22/95	None	WT-11
AM-704A	Aerobic Reactor	5/3/77	None	None
AM-705A	Aerobic Reactor	5/3/77	None	None
AM-705B	Aerobic Reactor	5/3/77	None	None
AF-760	Surge Tank	6/22/95	None	None
<del>AF-206A</del>	<del>88,128 gallon Waste Neutralizing Tank</del>	<del>5/3/77</del>	<del>N/A</del>	<del>None</del>
<del>AF-206B</del>	<del>88,128 gallon Waste Neutralizing Tank</del>	<del>5/3/77</del>	<del>N/A</del>	<del>None</del>
<del>AF-206C</del>	<del>88,128 gallon Waste Neutralizing Tank</del>	<del>5/3/77</del>	<del>N/A</del>	<del>None</del>
AR-751	500, 000 gallon UASB Reactor	2002	None	WT-11
<del>AR-754</del>	<del>4,000 gallon UASB Seed Storage Tank</del>	<del>2002</del>	<del>None</del>	<del>None</del>

<b>TABLE 5.11 UNIT ID 15 – 390 Million Btu/hr Boiler #<del>13</del></b>				
<b>Equip ID</b>	<b>Equipment Description</b>	<b>Installation Date</b>	<b>Control Device ID</b>	<b>Stack ID</b>
AB-350A	390 Million Btu/hr Boiler #3	2005	Low <del>NOx</del> -NOx Burners	U-11

<b>TABLE 5.12 UNIT ID 16 – 390 Million Btu/hr Boiler #<del>2-4</del></b>				
<b>Equip ID</b>	<b>Equipment Description</b>	<b>Installation Date</b>	<b>Control Device ID</b>	<b>Stack ID</b>
AB-350B	390 Million Btu/hr Boiler #4	2005	Low <del>NOx</del> -NOx Burners	U-12

<b><u>TABLE 5.13 UNIT ID Insignificant Activity Generators (IAG)</u></b>				
<b><u>Equip ID</u></b>	<b><u>Equipment Description</u></b>	<b><u>Order Date</u></b>	<b><u>Control Device ID</u></b>	<b><u>Stack ID</u></b>
<u>AM-819</u>	<u>Administration Building Emergency Generator</u>	<u>04/01/05</u>	<u>None</u>	<u>IAG-1</u>
<u>AM-840</u>	<u>PX Pump Emergency Generator</u>	<u>07/31/06</u>	<u>None</u>	<u>IAG-2</u>
<u>AM-846</u>	<u>Main Gate Emergency Generator</u>	<u>05/01/05</u>	<u>None</u>	<u>IAG-3</u>

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<b>TABLE 5.13 UNIT ID Insignificant Activity Generators (IAG)</b>				
<b>Equip ID</b>	<b>Equipment Description</b>	<b>Order Date</b>	<b>Control Device ID</b>	<b>Stack ID</b>
AM-847	Contractor Gate Emergency Generator	05/01/05	None	IAG-4
AM-848	T-Head Emergency Generator	05/01/05	None	IAG-5
AM-849	WWT Control Room Emergency Generator	12/01/07	None	IAG-6

## D. EMISSION LIMITS AND STANDARDS

Table 5.13 contains summaries of emission unit emission limits and standards.

<b>TABLE 5.13 EMISSION LIMITS AND STANDARDS</b>						
<b>Unit ID</b>	<b>Pollutant/Standard</b>	<b>Limit</b>	<b>Reference Method</b>	<b>Regulation</b>	<b>State Only</b>	<b>Condition Number</b>
All	VOCs	See Permit Condition	18	SC Reg. 61-62.5, Std.5.1	Yes	5.E. 17
03	CO	1452 lb/hr and 375 TPY	10B	SC Reg. 61-62.5, Section II (H)	No	5.E.4
03	VOCs	85 lb/hr and 80 TPY	18	SC Reg. 61-62.5, Section II (H)	No	5.E.4
03	PM <sub>10</sub>	2.16 lb/hr	201, 201A	SC Reg. 61-62.5, Section II (H)	No	5.E.4
03	VOCs	40 lb/hr & 80 TPY	18	SC Reg. 61-62.5, Section II (H)	No	5.E.4
03	CO	40 TPY	10B	SC Reg. 61-62.5, Section II (H)	No	5.E.4
03	VOCs	60 lb/hr & 165 TPY	18	SC Reg. 61-62.5, Section II (H)	No	5.E.4
03	CO	380 TPY	10B	SC Reg. 61-62.5, Section II (H)	No	5.E.4
03-06	VOCs	1825 TPY	Method 18 or 25A	Letter dated November 2, 1998, Construction Permit 0420-0029-CP & SC Reg. 61-62.1, Section II(H)	No	5.E.5
03-06	PM (HPV/GTS)	0.5 lb/10 <sup>6</sup> Btu	5	SC Reg. 61-62.1, Standard No. 3, Section III(I)	Yes	5.E.6
03-06	Opacity	20%	9	SC Reg. 61-62.1, Standard No. 3, Section III(I)	Yes	5.E.6
05	DRE	Less than 20 ppmv HAPs (HON regulation)	18 or 25A	SC Reg. 61-62.1, Sec. II(H)	No	5.E.6
03-06, 12-13	HAPs	See Condition	N/A	40 CFR 63, Subparts A, F, G and H	No	5.E.7, 5.E.10, 5.E.12, 5.E.13
03-04	TRE value	See Condition	Per 40 CFR 63	40 CFR 63.113 (d)	No	5.E.7



**TABLE 5.13 EMISSION LIMITS AND STANDARDS**

Unit ID	Pollutant/ Standard	Limit	Reference Method	Regulation	State Only	Condition Number
03-04	PM	56.0 lbs/hr	5	SC Regulation 61-62.5, Standard No. 4, Sec. VIII	No	5.E.8
03-04	Opacity (all)	20%	9	SC Regulation 61-62.5, Standard No. 4, Section IX	No	5.E.8
05-06	VOC	215.9 tpy and 49.3 lbs/hr	N/A	SC Regulation 61-62.5, Section II (H)	No	5.E.9
05-06	PM	53.67 lbs/hr	5	SC Regulation 61-62.5, Standard No. 4, Sec. VIII	No	5.E.9
05-06	Opacity (all)	20%	9	SC Regulation 61-62.5, Standard No. 4, Section IX	No	5.E.9
05	TOCs (VOCs)	See Condition	N/A	40 CFR 60 Subparts A and III	No	5.E.10
05	TOCs (VOCs)	See Condition	N/A	40 CFR 60 Subparts A and NNN	No	5.E.10
05	HAPs	See Condition	18	40 CFR 63 Subpart G	No	5.E.10
05	Halogens	See Condition	26	40 CFR 63 Subpart G	No	5.E.10
05-06	VOCs	See Condition	N/A	40 CFR 60 Subparts A and VV	No	5.E.10
07	PM	56.25 lbs/hr	5	SC Reg 61-62.5, Standard No. 4, Section VIII	No	5.E.11
07	Opacity	20%	9	SC Reg 61-62.5, Standard No. 4, Section IX	No	5.E.11
07	PM <sub>10</sub>	1.08 lb/hr (each for Silos CF-701-A-E)	As approved by BAQ	SC Reg. 61-62.1, Sec. II(H)	No	5.E.11
07	PM <sub>10</sub>	0.48 lb/hr (for Silo CF-701F)	As approved by BAQ	SC Reg. 61-62.1, Sec. II(H)	No	5.E.11
11	Opacity (all)	See Condition	9	SC Reg. 61-62.1, Sec. II(H)	No	5.E.14
11	PM/PM <sub>10</sub>	See Condition	5	SC Reg. 61-62.1, Sec. II(H)	No	5.E.14
11	SO <sub>2</sub>	See Condition	6	SC Reg. 61-62.1, Sec II(H)	No	5.E.14
11	NO <sub>x</sub>	See Condition	7	SC Reg. 61-62.1, Sec. II(H)	No	5.E.14
11	CO	See Condition	10	SC Reg. 61-62.1, Sec II(H)	No	5.E.14
11	VOCs	See Condition	25	SC Reg. 61-62.1, Sec. II(H)	No	5.E.14
11	Fuel sulfur content	See Condition	N/A	SC Reg. 61-62.1, Sec II(H)	No	5.E.14
11	Hours of operation	See Condition	N/A	SC Reg. 61-62.1, Sec. II(H) or 40 CFR 63 Subpart ZZZZ	No	5.E.14

**TABLE 5.13 EMISSION LIMITS AND STANDARDS**

Unit ID	Pollutant/Standard	Limit	Reference Method	Regulation	State Only	Condition Number
11	See Condition	See Condition	See Condition	40 CFR 63 Subpart ZZZZ	No	5.E.28
12	Opacity (all)	20%	9	SC Reg. 61-62.5, Std. 4, See IX	No	5.E.15
13	Opacity (all)	20%	9	SC Reg. 61-62.5, Std. 4, Section IX	No	5.E.16
15-16	Opacity	20%	9	40 CFR 60 Subpart Db	No	5.E.20-22
15-16	Opacity	20%	9	SC Reg. 61-62.5, Std.1, Section I	No	5.E.18
15-16	PM	0.6 lbs/10 <sup>6</sup> Btu (3 hour average)	5, 5B or 17	SC Reg. 61-62.5, Std.1, Section II	No	5.E.18
15-16	PM/PM <sub>10</sub>	50.9 TPY, total for both boilers combined (12-month rolling sum)	5, 5B or 17	SC Regulation 61-62.1, Section II.H	No	5.E.19
05 15-16	PM See Condition	0.03 lb/10 <sup>6</sup> Btu of heat input, each (30-day average) See Condition	5NA	40 CFR 63 Subpart DDDDD	No	5.E.24-26
15-16	SO <sub>2</sub>	3.5 lbs/10 <sup>6</sup> Btu	6 or 6C	SC Reg. 61-62.5, Std.1, Section III	No	5.E.18
15-16	SO <sub>2</sub>	733.4 TPY, total for both boilers combined (12-month rolling sum)	6 or 6C	SC Regulation 61-62.1, Section II.H	No	5.E.19
15-16	NO <sub>x</sub>	0.10 lb/10 <sup>6</sup> Btu, each (30-day rolling average)	NO <sub>x</sub> monitoring system under 40 CFR 60.48b	40 CFR 60.44.b	No	5.E.20, 5.E.23
15-16	NO <sub>x</sub>	317.0 TPY, total for both boilers combined (12-month rolling sum)	7 or 7E	SC Regulation 61-62.1, Section II.H	No	5.E.19
15-16	CO	299.6 TPY, total for both boilers combined (12-month rolling sum)	10	SC Regulation 61-62.1, Section II.H	No	5.E.19
15-16	CO	400 ppm by volume on a dry basis corrected to a 3 percent oxygen, each (30-day average)	CO monitoring system under 40 CFR 63 Subpart DDDDD	40 CFR 63 Subpart DDDDD	No	5.E.24-25
15-16	Hydrogen Chloride	0.0005 lb/10 <sup>6</sup> Btu of heat input, each	26	40 CFR 63 Subpart DDDDD	No	5.E.24-26
15-16	Used oil	See Condition	N/A	SC Regulation 61-62.1	Yes	5.E.29
15-16	NO <sub>x</sub> Budget	N/A	N/A	SC Regulation 61-62.96	No	5.E.27

**TABLE 5.13 EMISSION LIMITS AND STANDARDS**

Unit ID	Pollutant/ Standard	Limit	Reference Method	Regulation	State Only	Condition Number
03	VOCs	Voluntary LDAR Program	N/A	SC Regulation 61-62.1, Section II.H	No	5.E.30
IAG	See Condition	See Condition	See Condition	40 CFR 63 Subpart ZZZZ	No	5.E.32
IAG	See Condition	See Condition	See Condition	40 CFR 60 Subpart IIII	No	5.E.33

The maximum allowable emission limits above are derived from the various Federal and State regulations that govern the operation of this type of source. All applicable facility wide emission limits and corresponding regulations are listed above. Additional operating requirements which may be more stringent than those above are contained in Part 4.0, Part 6.0, and Part 7.0 of this permit.

#### **E. EMISSION UNIT CONDITIONS**

Condition Number	Conditions
	Conditions 5.E.1-5.E.3 Voided
5.E.4	<p>For Cooper River #1, emission limitations were established to avoid a PSD review for the project to debottleneck Cooper River #1 and #2 that was approved in Construction Permit Nos. 0420-0029-CJ, CK and CL. Also for Cooper River #1, emission limitations were updated and added_ to avoid a PSD review for the project to complete an emission reduction project that was approved in Construction Permit No. 0420-0029-CP.</p> <p><del>The maximum allowable CO emission rate from the #1 HPVGTS is 1452 lb/hr and 375 TPY.</del></p> <p><del>The maximum allowable VOC emission rate from the #1 HPVGTS is 85 lb/hr and 80 TPY.</del></p> <p>The maximum allowable PM<sub>10</sub> emission rate from the #1 Silo Scrubber is 2.16 lb/hr.</p> <p><del>The maximum allowable VOC emission rate from the BT 603 LPA is 80 TPY and 40 lb/hr.</del></p> <p><del>The maximum allowable CO emission rate from the BT 603 LPA is 40 TPY.</del></p> <p><del>The maximum allowable VOC emission rate from the BT 702 DHT Scrubber is 165 TPY and 60 lb/hr.</del></p> <p><del>The maximum allowable CO emission rate from the BT 702 DHT Scrubber is 380 TPY.</del></p>
5.E.5	<p><del>For Cooper River #1 and #2, a combined emission limitation for VOCs was established to avoid a PSD review at the time of the project approved in 1995 to construct a new purified terephthalic acid (PTA) production process, designated as Cooper River #2. The limit was revised based on PSD review at the time of construction projects in 2000 and 2004. The maximum allowable VOC emission rate is 1825 tons per year; this limit incorporates all VOC limits from previous construction permits.</del></p>
5.E.6	<p><del>Emission Unit 03-06</del></p> <p><del>The following shall apply to the HPVGTS on the units:</del></p> <p><del>The permittee shall operate the catalytic oxidizers (BR 1814 and DR 1814) in compliance with the requirements of SC Regulation 61-62.5, Standard No. 3. SC Regulation 61-62.5, Standard No. 3 establishes the maximum allowable emissions of PM of 0.5lb/10<sup>6</sup> Btu to be emitted from the catalytic oxidizers and establishes the opacity limitation of 20%.</del></p> <p><del>The CR#2 HPVGTS shall be limited to less than 20 ppmv HAPs through its vent, per requirements in the HON. SC Regulation 61-62.1, Section II(H) requires a destruction and removal efficiency (DRE) of 95%; this requirement is satisfied by the HON limit, which is more stringent.</del></p>

Condition Number	Conditions																				
5.E.7	The following emission points in units 03-04 are subject to 40 CFR 63, Subparts A, F, G and H:  Emission Unit ID 03 Cooper River #1: Oxidation Unit																				
	<table><tr><th>Equipment ID</th><th>Equipment Description</th><th>Emission Point</th><th>Group Classification</th><th>Stack ID</th></tr><tr><td>BT-401</td><td>High Pressure Absorber (Recovery Device for Air Oxidation Reactors and Dehydration Tower)</td><td>Process Vent</td><td>Group 2; TRE&gt;4</td><td>N/A</td></tr><tr><td>BT-702 BT-603</td><td>Dehydration Tower Scrubber (Recovery Device for Dehydration Tower) Low Pressure Absorber (Recovery device for Dehydration Tower system)</td><td>Process Vent</td><td>Group 2; 1&lt;TRE&lt;4</td><td>O-230-2</td></tr><tr><td>N/A</td><td>Piping Equipment</td><td>Equipment Leak</td><td>N/A</td><td>N/A</td></tr></table>	Equipment ID	Equipment Description	Emission Point	Group Classification	Stack ID	BT-401	High Pressure Absorber (Recovery Device for Air Oxidation Reactors and Dehydration Tower)	Process Vent	Group 2; TRE>4	N/A	BT-702 BT-603	Dehydration Tower Scrubber (Recovery Device for Dehydration Tower) Low Pressure Absorber (Recovery device for Dehydration Tower system)	Process Vent	Group 2; 1<TRE<4	O-230-2	N/A	Piping Equipment	Equipment Leak	N/A	N/A
	Equipment ID	Equipment Description	Emission Point	Group Classification	Stack ID																
	BT-401	High Pressure Absorber (Recovery Device for Air Oxidation Reactors and Dehydration Tower)	Process Vent	Group 2; TRE>4	N/A																
	BT-702 BT-603	Dehydration Tower Scrubber (Recovery Device for Dehydration Tower) Low Pressure Absorber (Recovery device for Dehydration Tower system)	Process Vent	Group 2; 1<TRE<4	O-230-2																
N/A	Piping Equipment	Equipment Leak	N/A	N/A																	
For the Group 2 Process Vent at BT-401 (CR#1 High Pressure Absorber), which includes emissions from the Air Oxidation Reactors (BR-301 A-D) and Dehydration Tower (BT-701/BE-706) Pursuant to 40 CFR 63.113 (e), the permittee shall maintain a TRE greater than 4.0. For the Group 2 Process Vent at BT-702-603 (CR#1 Dehydration Tower Scrubber Low Pressure Absorber), which includes emissions from Dehydration Tower System including the Dehydration Tower (BT-701/BE-706) and BT-750 Entrainer Tower Pursuant to 40 CFR 63.113(d), the permittee shall maintain a TRE greater than 1.0.																					
For purposes of determining process vent stream flow rate, total organic hazardous air pollutants or total organic carbon concentration or TRE index value, as specified under paragraph (b), (c), or (d) of §63.115, the sampling site shall be after the last recovery device but prior to the inlet of any control device that is present prior to release to the atmosphere.																					
To determine the TRE index value, the owner or operator shall conduct a TRE determination and calculate the TRE index value according to the procedures in paragraph (d)(1) or (d)(2) of §63.115 and the TRE equation in paragraph (d)(3) of §63.115.																					
5.E.8	Emission Units 03-04 The permittee shall operate emission units 03 and 04 in compliance with the requirements of SC Regulation 61-62.5, Standard No. 4. SC Regulation 61-62.5, Standard No. 4 establishes the maximum allowable emissions of PM to be emitted from emission units 03 and 04 (combined) and establishes the opacity limitation for emission units 03 and 04. Actual PM emissions from emission units 03 and 04 (combined) shall be less than or equal to the maximum allowable emissions. For each point and fugitive source within emission unit 03 and 04, the opacity shall be limited to 20%.																				
5.E.9	Emission Units 05-06 The permittee shall operate emission units 05 and 06 in compliance with the requirements of SC Regulation 61-62.5, Standard No. 4. SC Regulation 61-62.5, Standard No. 4 establishes the maximum allowable emissions of PM to be emitted from emission units 05 and 06 (combined) and establishes the opacity limitation for emission units 05 and 06. Actual PM emissions from emission units 05 and 06 (combined) shall be less than or equal to the maximum allowable emissions. For each point and fugitive source within emission unit 05 and 06, the opacity shall be limited to 20%.																				

5.E.10

The following emission points in emissions units 05-06 are subject to 40 CFR 63, Subparts A, F, G and H:  
EMISSION Unit ID 05 Cooper River #2: Oxidation Unit

Equipment ID	Equipment Description	Emission Point	Group Classification	Stack ID
DT-111	High Pressure Absorber (Recovery Device for Air Oxidation Reactors and Dehydration Tower)	Process Vent	Group 2: TRE > 4	N/A
DT-302	Low Pressure Absorber (Recovery device for Dehydration Tower System)	Process Vent	Group 2: 1 < TRE < 4	O2-1
N/A	Piping Equipment (in HAPs Service)	Equipment Leak	N/A	N/A

Per 63.113(d), the owner or operator of a Group 2 process vent having a flow rate greater than or equal to 0.005 standard cubic meter per minute, a HAP concentration greater than or equal to 50 parts per million by volume, and a TRE index value greater than 1.0 but less than or equal to 4.0 shall maintain a TRE index value greater than 1.0 and shall comply with the monitoring of recovery device parameters in §63.114(b) or (c) of this subpart, the TRE index calculations of §63.115 of this subpart, and the applicable reporting and recordkeeping provisions of §§63.117 and 63.118 of this subpart. Such owner or operator is not subject to any other provisions of §§63.114 through 63.118 of this subpart.

Per §63.113(a)(2), the owner or operator of a Group 1 process vent shall reduce emissions of total organic hazardous air pollutants by 98 weight percent or to a concentration of 20 parts per million by volume, whichever is less stringent. For combustion devices, the emission reduction or concentration shall be calculated on a dry basis, corrected to 3 percent oxygen, and compliance can be determined by measuring either organic hazardous air pollutants or total organic carbon using the procedures in §63.116 of Subpart G.

Per §63.113(c)(1), if a combustion device is used to comply with §63.113(a)(2) for a halogenated vent stream, then the vent stream exiting the combustion device shall be ducted to a halogen reduction device. The halogen reduction device shall reduce overall emissions of hydrogen halides and halogen, as defined in §63.111, by 99 percent or shall reduce the outlet mass of total hydrogen halides and halogens to less than 0.45 kilogram per hour, whichever is less stringent.

The permittee shall operate the air oxidation reactors in compliance with the requirements of 40 CFR 60, Subpart III. However since the vent is also a HON Group 1 process vent, it is required to comply only with the provisions of 40 CFR 63 Subpart G.

The permittee shall operate the dehydration tower in compliance with the requirements of 40 CFR 60, Subpart NNN. However since the vent is also a HON Group 1 process vent, it is required to comply only with the provisions of 40 CFR 63 Subpart G.

The following emission points within emission units 05-06 are subject to the requirements of 40 CFR 60, Subparts A and VV:

Equip ID	Equipment Description	Emission Point	Group Classification	Stack ID
N/A	Piping Equipment (in VOC Service)	Equipment Leak	N/A	N/A

Non-Confidential

5.E.10a	<p>The permittee shall operate the air oxidation reactors in compliance with the requirements of 40 CFR 60, Subpart III. Per 60.610 (c), each affected facility that has a total resource effectiveness (TRE) index value greater than 4.0 is exempt from all provisions of this subpart except for §§60.612, 60.614(f), 60.615(h), and 60.615(l). Per 60.612(c), maintain a TRE index value greater than 1.0 without use of VOC emission control devices.</p> <p>The permittee shall operate the dehydration tower in compliance with the requirements of 40 CFR 60, Per 60.660 (c)(4), each affected facility that has a total resource effectiveness (TRE) index value greater than 8.0 is exempt from all provisions of this subpart except for §§60.662; 60.664 (d), (e), and (f); and 60.665 (h) and (l). Per 60.662 (c), maintain a TRE index value greater than 1.0 without use of VOC emission control devices.</p>																									
5.E.11	<p>Emission Units 07</p> <p>The permittee shall operate emission unit 07 in compliance with the requirements of SC Regulation 61-62.5, Standard No. 4. SC Regulation 61-62.5, Standard No. 4 establishes the maximum allowable emissions of PM to be emitted from emission units 07 and establishes the opacity limitation for emission unit 07. Actual PM emissions from emission unit 07 shall be less than or equal to the maximum allowable emissions. For each point and fugitive source within emission unit 07, the opacity shall be limited to 20%.</p> <p>The permittee shall also comply with the synthetic minor emission limitation for PM<sub>10</sub> that was established to avoid a PSD review at the time of the construction project approved in 2000 to debottleneck Cooper River #1 and Cooper River #2. The emission limitation is 1.08 lb/hr each for Silos CF-701 (A-E) and 0.48 lb/hr for Silos CF-701F.</p>																									
5.E.12	<p>The following emission points within emission unit 12 are subject to the requirements of 40 CFR 63, Subparts A, F, G and H:</p> <p>Emission Unit ID 12- Tank Farm</p> <table><tr><th>Equip ID</th><th>Equipment Description</th><th>Emission Point</th><th>Group Classification</th><th>Stack ID</th></tr><tr><td>AF-101</td><td>Px Storage Tank (internal floating roof)</td><td>Storage Tank</td><td>Group 2</td><td>TK-1</td></tr><tr><td>AF-102</td><td>Px Storage Tank (internal floating roof)</td><td>Storage Tank</td><td>Group 2</td><td>TK-2</td></tr><tr><td>AF-103</td><td>Px Storage Tank (Internal floating roof)</td><td>Storage Tank</td><td>Group 2</td><td>TK-6</td></tr><tr><td>N/A</td><td>Px Unloading Station-Piping Equipment</td><td>Equipment Leak</td><td>N/A</td><td>N/A</td></tr></table> <p>For each Group 2 storage vessel that is not part of an emissions average as described in §63.150 of Subpart G, the owner or operator shall comply with the record keeping requirement in §63.123(a) of Subpart G and is not required to comply with any other provisions in §63.119 through §63.123 of the Subpart.</p>	Equip ID	Equipment Description	Emission Point	Group Classification	Stack ID	AF-101	Px Storage Tank (internal floating roof)	Storage Tank	Group 2	TK-1	AF-102	Px Storage Tank (internal floating roof)	Storage Tank	Group 2	TK-2	AF-103	Px Storage Tank (Internal floating roof)	Storage Tank	Group 2	TK-6	N/A	Px Unloading Station-Piping Equipment	Equipment Leak	N/A	N/A
Equip ID	Equipment Description	Emission Point	Group Classification	Stack ID																						
AF-101	Px Storage Tank (internal floating roof)	Storage Tank	Group 2	TK-1																						
AF-102	Px Storage Tank (internal floating roof)	Storage Tank	Group 2	TK-2																						
AF-103	Px Storage Tank (Internal floating roof)	Storage Tank	Group 2	TK-6																						
N/A	Px Unloading Station-Piping Equipment	Equipment Leak	N/A	N/A																						

5.E.13	The following emission points within emission unit 13 are subject to the requirements of 40 CFR 63, Subparts A, F, G, and H:			
	Emission Unit 13-Wastewater Treatment			
	Equip ID	Equipment Description	Emission Point	Group Classification
	AM-775	Anaerobic Reactor	N/A	Group 2
	AM-704A	Aerobic Basin	N/A	Group 2
	AM-705A	Aerobic Basin	N/A	Group 2
	AM-705B	Aerobic Basin	N/A	Group 2
	AR-751	500,000 gallon UASB Reactor	N/A	Group 2
	AF-754	4,000 gallon UASB Seed Storage Tank	N/A	Group 2
Emission Unit 13-Wastewater Treatment-The process wastewater has been determined (at the point of determination) to be a Group 2 wastewater stream. No further controls are required on this stream. Records of this determination are maintained at the facility.				

5.E.14

Emission Unit 11

The permittee shall operate each generator, compressor, and pump in compliance with the applicable requirements of 40 CFR 63 Subpart ZZZZ, National Emission Standards For Hazardous Air Pollutants For Stationary Reciprocating Internal Combustion Engines

The permittee shall operate each generator, compressor, and pump in compliance with the requirements of SC Regulation 61-62.5, Standard No. 4. SC Regulation 61-62.5, Standard No. 4 establishes the respective opacity limitations for these units. The opacity limitation for the generators, compressors, and pumps are summarized in the table below.

The allowable operating hours per year and fuel sulfur content (percent sulfur) for each generator, compressor, and pump is summarized in the table below.

Equip ID	Combustion Source	Opacity	PM/PM <sub>10</sub>	SO <sub>2</sub>	NO <sub>x</sub>	CO	VOC	No. 2 fuel oil Percent Sulfur	Hrs/yr
AM-804	Emergency Generator #1	40%	N/A	N/A	N/A	N/A	N/A	<0.3%	No limits <100**
AC-402	Emergency Compressor #1	40%	N/A	N/A	N/A	N/A	N/A	<0.3%	No limits <100**
AG-202B	Emergency Fire Water Pump	40% 20%	N/A	N/A	N/A	N/A	N/A	<0.3%	No limits <100**
AG-229	T-Head FW Pump	40% 20%	N/A	N/A	N/A	N/A	N/A	<0.3%	No limits <100**
AG-202C	Emergency Fire Water Pump	20%	N/A	N/A	N/A	N/A	N/A	<0.05%	<250
AG-202D	Emergency Fire Water Pump	20%	N/A	N/A	N/A	N/A	N/A	<0.05%	<250
BM-1201	Emergency Generator #2 (CR#1)	40%	N/A	N/A	N/A	N/A	N/A	<0.3%	<250 <100**
DM-135	Emergency Generator #3 (CR#2)	20%	0.368	0.355	5.2	0.20	0.175	<0.05%	<500
AC-404	Emergency Air Compressor #2 (Utility)	20%	0.175	1.165	14.265	0.65	0.60	<0.05%	<1,000 <500
AM-838	IT Emergency Generator	20%	N/A	N/A	3.64	N/A	N/A	<0.05%	<500
L-1 and L-2	(Leased) Compressors #1 and #2	20%	7.884	13.14	15.33	3.286	2.322	<0.0015% **	8760*

\* Total for both compressors

\*\*Limit per 40 CFR 63 Subpart ZZZZ

5.E.15

Emission Unit 12

The permittee shall operate emission unit 12 in compliance with the requirements of SC Regulation 61-62.5, Standard No. 4. SC Regulation 61-62.5, Standard No. 4 establishes the opacity limitation for emission unit 12. The opacity limitation for each point and fugitive emissions source within emission unit 12 is as follows:

Source Description	Stack ID No.	Opacity Limitation
Px Storage Tank (internal floating roof)	TK-1	20%
Px Storage Tank (internal floating roof)	TK-2	20%
Px Storage Tank (internal floating roof)	TK-6	20%



5.E.16	<p><del>Emission Unit 13</del></p> <p><del>The permittee shall operate emission unit 13 in compliance with the requirements of SC Regulation 61-62.5, Standard No. 4. SC Regulation 61-62.5, Standard No. 4 establishes the opacity limitation for emission unit 13. The opacity limitation for each point and fugitive emission source within emission unit 13 shall be limited to 20%.</del></p>
	<p><del>Conditions 5.E.15 and 5.E.16 Voided</del></p>
5.E.17	<p><del>When the "Net Volatile Organic Compound (VOC) Emissions Increase" for any new, modified or altered source exceeds 100 tons per year since June 25, 2004, Best Available Control technology shall be applied to the construction permit.</del></p> <p><del>The "Net Volatile Organic Compound (VOC) Emissions Increase" from this facility shall not exceed 100 tons since July 1, 1979. The "Net VOC Emissions Increase" includes any increases and decreases in the actual VOC emissions at the facility that have occurred since July 1, 1979 and are otherwise creditable. Increases in the VOC emissions from these existing sources may be subject to the applicability requirements of SC Regulation 61-62.5, Standard No. 5.1, Best Available Control Technology (BACT)/Lowest Achievable Emission Rate ("LAER") Applicable To Volatile Organic Compounds.</del></p>
5.E.18	<p>The permittee shall operate Boiler No. 3 (AB-350A) and Boiler No. 4 (AB-350B) in compliance with the requirements of SC Regulation 61-62.5, Standard No. 1. In accordance with SC Regulation 61-62.5, Standard No. 1 - Emissions from Fuel Burning Operations, Section II - Particulate Matter Emissions, the allowable discharge of particulate matter resulting from the fuel burning operations is 0.6 lbs/10<sup>6</sup> BTU input.</p> <p>In accordance with SC Regulation 61-62.5, Standard No. 1 - Emissions from Fuel Burning Operations, Section III - Sulfur Dioxide Emissions, the maximum allowable discharge of SO<sub>2</sub> resulting from the fuel burning operations is 3.5 lbs/10<sup>6</sup> BTU input.</p> <p>Boiler No. 3 and Boiler No. 4 are permitted to burn only natural gas, No. 2 VLSD (Very Low Sulfur Distillate) fuel oil, <u>and</u> biogas from the Anaerobic reactor or UASB <del>and onsite spec used oil</del> as a fuel. The No. 2 VLSD fuel oil, <u>which is only to be burned during a natural gas supply curtailment</u>, sulfur content shall be less than or equal to 0.5% by weight. The use of any other substances as fuel is prohibited without prior written approval from the Bureau of Air Quality.</p> <p>In accordance with SC Regulation 61-62.5, Standard No. 1, Emissions from Fuel Burning Operations, Boiler No. 3 and Boiler No. 4 shall not discharge into the ambient air smoke which exceeds an opacity of 20%. The twenty (20) percent opacity limit may be exceeded for soot blowing, but may not be exceeded for more than six (6) minutes in a one hour period nor be exceeded for more than a total of twenty-four (24) minutes in a twenty-four (24) hour period. Emissions caused by soot blowing shall not exceed sixty (60) percent opacity. The opacity standards set forth above do not apply during startup or shutdown. The owner/operator shall, to the extent practicable, maintain and operate any source including associated air pollution control equipment in a manner consistent with good air pollution control practices for minimizing emissions. The owner/operator shall, for a period of at least five (5) years maintain a log of the time, magnitude, duration and any other pertinent information to determine periods of startup and shutdown and make these records available to a Department representative upon request.</p> <p>Also see condition 5.E.21 for the opacity requirements for the NSPS regulation.</p>

5.E.19	Boiler No. 3 and Boiler No. 4 are permitted to burn only <del>distillate fuel oil</del> , natural gas, <del>and</del> bio-gas <del>and on-site generated spec-used oil</del> . <u>They are also permitted to burn distillate fuel oil as a back-up fuel in case of a natural gas supply interruption.</u> The distillate fuel oil will be VLSD fuel oil meeting the definition of “very low sulfur oil” contained in 40 CFR 60.41b, which has a maximum sulfur content of 0.5 percent. Boiler No. 3 and Boiler No. 4 <del>combined</del> are <u>each</u> limited to <del>18,675,000, 400,000</del> gallons of VLSD fuel oil per year. <del>Based on the PTE calculations, this equates to operating each boiler at a maximum of 3,150 hours per year on VLSD fuel oil. Each boiler would be operated on natural gas for the remainder of the year. The on-site generated spec-used oil burned in the boilers is subject to a limit of 10,000 gallons per year.</del> The biogas is subject to a limit of 440 x10 <sup>6</sup> SCF per year. The use of any other substances is prohibited without prior written approval from the Bureau of Air Quality. The term year in this condition refers to a rolling 12-month sum. The emissions for PM/PM <sub>10</sub> , SO <sub>2</sub> , NO <sub>x</sub> , and CO shall be calculated using a 12-month rolling sum. The Synthetic Minor limits (S.C. Regulation 61-62.1, Section II.H) are as stated in Table 5.13.												
5.E.20	Boiler No. 3 and Boiler No. 4 are subject to the applicable requirements of 40 CFR 60 Subparts A and Db, New Source Performance Standards for Industrial, Commercial, and Institutional Steam Generating Units. <u>The boilers are gas boilers which will only burn oil infrequently and are limited to less than a 10% capacity factor.</u>												
5.E.21	Per 40 CFR 60 Subpart Db for opacity, the permittee is limited to an opacity of 20% except for one 6-minute period per hour of 27%. This NSPS opacity standard does not apply during start-up and shutdown <del>– and while burning natural gas.</del>												
5.E.22	Per §60.48b(a) <del>13(1)(2)</del> , the owner or operator of an affected <del>facility subject to the opacity standard under §60.43b shall install, calibrate, maintain, and operate a continuous monitoring system for measuring the opacity of emissions discharged to the atmosphere and record the output of the system that limits oil burning to a 10% capacity factor and will only burn oil infrequently can</del> monitor opacity according to an approved alternative monitoring plan. BP CR will submit the <u>alternative monitoring plan to the agency for approval.</u>												
5.E.23	Per 40 CFR 60 Subpart Db, the NO <sub>x</sub> limit is 0.10 lb/ 10 <sup>6</sup> Btu (for low release rate) and 0.20 lb/10 <sup>6</sup> Btu (for high release rate).												
5.E.24	Boiler No. 3, <del>and</del> Boiler No. 4 <del>and 2 HPVGTS heater DB-1813</del> shall be in compliance with 40 CFR 63 Subpart DDDDD, “National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Process Heaters” <del>upon start-up of these units by the appropriate compliance date in the final regulation.</del> The permittee must submit an Initial Notification <del>not later than 120 days after becoming subject to this subpart and</del> Notice of Compliance <u>status containing the information listed in the regulation by the dates stated in the regulation.</u> The Initial Notification must include the information required in §63.7545, as applicable. The permittee shall be in compliance with the emission limits and the work practice standards in this subpart at all times, <del>except during periods of startup, shutdown and malfunction.</del>												
5.E.25	<p>New or reconstructed boilers and process heaters in one of the liquid fuel subcategories that burn only fossil fuels and other gases and do not burn any residual oil are subject to the emission limits and applicable work practice standards shown below. The permittee is not required to conduct a performance test to demonstrate compliance with the emission limits. The permittee is not required to maintain operating limits to demonstrate continuous compliance with the emission limits.</p> <table><tr><th>Pollutant</th><th>MACT</th><th>Limit</th></tr><tr><td>Particulate Matter</td><td>No control required</td><td>0.03 lb/10<sup>6</sup> Btu of heat input</td></tr><tr><td>Hydrogen Chloride</td><td>No control required</td><td>0.0005 lb/10<sup>6</sup> Btu of heat input</td></tr><tr><td>Carbon Monoxide</td><td>CEMS required</td><td>400 ppm by volume on a dry basis corrected to 3 percent oxygen (30-day average)</td></tr></table>	Pollutant	MACT	Limit	Particulate Matter	No control required	0.03 lb/10 <sup>6</sup> Btu of heat input	Hydrogen Chloride	No control required	0.0005 lb/10 <sup>6</sup> Btu of heat input	Carbon Monoxide	CEMS required	400 ppm by volume on a dry basis corrected to 3 percent oxygen (30-day average)
Pollutant	MACT	Limit											
Particulate Matter	No control required	0.03 lb/10 <sup>6</sup> Btu of heat input											
Hydrogen Chloride	No control required	0.0005 lb/10 <sup>6</sup> Btu of heat input											
Carbon Monoxide	CEMS required	400 ppm by volume on a dry basis corrected to 3 percent oxygen (30-day average)											
5.E.26	<u>To demonstrate initial compliance for PM and HCl, the permittee must include a signed statement in the NOCS report required in §63.7545(e) that indicates the facility burns only liquid fossil fuels other than residual oils, either alone or in combination with gaseous fuels.</u>												
5.E.27	Per S.C. Regulation 61-62.96, Boiler No. 3 and Boiler No. 4 will be NO <sub>x</sub> Budget units as they will commence operation after January 1, 1999 and have a maximum design heat input greater than 250 x10 <sup>6</sup> Btu/hr.												

5.E.28	The facility is subject to the applicable requirements of 40 CFR 63 Subpart ZZZZ, National Emission Standards For Hazardous Air Pollutants For Stationary Reciprocating Internal Combustion Engines.										
<del>5.E.29</del>	<del>The content of the on-site generated spec used oil shall meet the definition of used oil as defined by Section I, definition 83, of SC Regulation 61-62.1.</del>										
	<del>Conditions 5.E.28 and 5.E.29 Voided</del>										
5.E.30	The facility shall implement a VOC LDAR (Leak Detection and Repair Program) equivalent to the requirements of 40 CFR 60 Subpart VV (per the regulation as of November 1, 2006) and submit to the Department before placing construction permit 0420-0029 CR into operation. The use of the LDAR program was voluntarily used for the purpose of a PSD offset.										
<del>5.E.31</del>	<del>For Cooper River #2, emission limitations were established to avoid a PSD review for the project to construct Cooper River #2 that was approved in Construction Permit Nos. 0420-0029 CF. The maximum allowable VOC emission rate from the #2 OX and PTA units is 215.9 tpy and 49.3 lbs/hr.</del>										
5.E.32	<p><u>Insignificant Activity Generators</u>  The permittee shall operate each generator, compressor, and pump in compliance with the requirements of 40 CFR 63 Subpart ZZZZ. The respective requirements for AM-819, AM-846, AM-847, and AM-848 are summarized below.</p> <table> <tr> <th><u>Requirement</u></th><th><u>Limit</u></th></tr> <tr> <td><u>Hours of operation per year for maintenance checks and readiness testing</u></td><td><u>100 hrs/yr</u></td></tr> <tr> <td><u>Minimize the engine's time spent at idle and engine's startup time</u></td><td><u>Minimize to a period needed for appropriate and safe loading of the engine, not to exceed 30 minutes</u></td></tr> <tr> <td><u>Work Practices</u></td><td><u>Change oil &amp; filter every 500 hours, Inspect air cleaner every 1,000 hours, Inspect/Replace as necessary hose &amp; belt every 500 hours or do these annually; whichever comes sooner.</u></td></tr> <tr> <td><u>Operate &amp; maintain per plan</u></td><td><u>Must operate and maintain according to the manufacturer's emission related written instructions or develop your own maintenance plan which must provide to the extent practicable for the maintenance and operation of the engine in a manner consistent with good air pollution control practice for minimizing emissions</u></td></tr> </table>	<u>Requirement</u>	<u>Limit</u>	<u>Hours of operation per year for maintenance checks and readiness testing</u>	<u>100 hrs/yr</u>	<u>Minimize the engine's time spent at idle and engine's startup time</u>	<u>Minimize to a period needed for appropriate and safe loading of the engine, not to exceed 30 minutes</u>	<u>Work Practices</u>	<u>Change oil &amp; filter every 500 hours, Inspect air cleaner every 1,000 hours, Inspect/Replace as necessary hose &amp; belt every 500 hours or do these annually; whichever comes sooner.</u>	<u>Operate &amp; maintain per plan</u>	<u>Must operate and maintain according to the manufacturer's emission related written instructions or develop your own maintenance plan which must provide to the extent practicable for the maintenance and operation of the engine in a manner consistent with good air pollution control practice for minimizing emissions</u>
<u>Requirement</u>	<u>Limit</u>										
<u>Hours of operation per year for maintenance checks and readiness testing</u>	<u>100 hrs/yr</u>										
<u>Minimize the engine's time spent at idle and engine's startup time</u>	<u>Minimize to a period needed for appropriate and safe loading of the engine, not to exceed 30 minutes</u>										
<u>Work Practices</u>	<u>Change oil &amp; filter every 500 hours, Inspect air cleaner every 1,000 hours, Inspect/Replace as necessary hose &amp; belt every 500 hours or do these annually; whichever comes sooner.</u>										
<u>Operate &amp; maintain per plan</u>	<u>Must operate and maintain according to the manufacturer's emission related written instructions or develop your own maintenance plan which must provide to the extent practicable for the maintenance and operation of the engine in a manner consistent with good air pollution control practice for minimizing emissions</u>										

5.E.33	<u>Insignificant Activity Generators</u>	
	<u>The permittee shall operate generators AM-840 and AM-849 in compliance with the requirements of 40 CFR 60 Subpart IIII. The respective requirements are summarized below:</u>	
	<u>Requirement</u>	<u>Limit</u>
	<u>AM-840 meet Table 1 standards in 40 CFR 60 Subpart IIII</u>	<u>HC – 1.0 g/HP-hr</u> <u>NOx – 6.9 g/HP-hr</u> <u>CO – 8.5 g/HP-hr</u> <u>PM – 0.40 g/HP-hr</u>
	<u>Hours of operation per year for maintenance checks and readiness testing</u>	<u>100 hrs/yr</u>
	<u>Operate &amp; maintain per plan</u>	<u>Operate and maintain the stationary CI internal combustion engine and control device according to the manufacturer's emission-related written instructions:</u>
	<u>AM-849 meet Table 1 Tier 2 standards in 40 CFR 89.112</u>	<u>NMHC + NOx – 7.5 g/KW-hr</u> <u>CO – 5.0 g/KW-hr</u> <u>PM – 0.40 g/KW-hr</u>

## PART 6.0 MONITORING AND REPORTING REQUIREMENTS

[SC Regulation 61-62.1, Section II]; [SC Regulation 61-62.70.6(a)(3)(i)(B)]

### A. MONITORING AND REPORTING

Table 6.1 contains summaries of the monitoring and reporting required of this facility.

<b>TABLE 6.1 MONITORING AND REPORTING</b>						
<b>Unit ID</b>	<b>Pollutant/Parameter</b>	<b>Limit</b>	<b>Required Monitoring</b>	<b>Monitoring Frequency</b>	<b>Reporting Frequency</b>	<b>Condition Number</b>
<del>01-14</del> <del>03-16</del>	Record keeping	See Condition	N/A	N/A	See Condition	6.B.1
<del>01-14</del> <del>03-16</del>	Reporting	See Condition	N/A	N/A	N/A	6.B.3
<del>01-14</del> <del>03-16</del>	VOCs	100 TPY VOC Net Increase	See Condition	See Condition	See Condition	6.B.34
<del>01-14</del> <del>03-16</del>	Source Testing	See Condition	See Condition	See Condition	See Condition	6.B.25
03	CR#1 Ox Unit Production	See Condition	See Condition	See Condition	Semiannual	6.B.7
03-14	Opacity	20%	Visual Inspection	Semiannual	Semiannual	6.B.2
<del>03-06</del>	<del>PM Testing/Operator Training</del>	<del>N/A</del>	<del>See Condition</del>	<del>See Condition</del>	<del>See Condition</del>	<del>6.B.35</del>
03	Calculated delta T (CR#1-HPVGTS)	See Condition (CAM)	Record keeping	Continuously with daily average	Semiannual	6.B.21, 6.B.24

**TABLE 6.1 MONITORING AND REPORTING**

Unit ID	Pollutant/Parameter	Limit	Required Monitoring	Monitoring Frequency	Reporting Frequency	Condition Number
03	Inlet temperature (CR#1-HPVGTS)	See Condition (CAM)	Record keeping	Continuously with daily average	Semiannual	6.B.21, 6.B.24
03	Liquid flow rate (Intermediate Storage Silo Scrubber BT-501)	See Condition (CAM)	Record keeping	Continuously with daily average	Semiannual	6.B.20, 6.B.24
03	Water and Acetic Acid Scrubbing Flow Rates (DHT Scrubber)	See Condition	Record keeping	Continuously with daily average	Semiannual	6.B.6
03	Acetic Acid Scrubbing Liquid temperature (DHT Scrubber)	See Condition	Record keeping	Continuously with daily average	Semiannual	6.B.6
03	BT-603 LPA Top Temperature & scrubbing liquid flow	See Condition (CAM)	Record keeping	Continuously with daily average	Semiannual	6.B.20, 6.B.24
03	Condenser (BE 645)	See Condition	Record keeping	Daily	Semiannual	6.B.19
03	TRE Value (HPA)	> 4	Record keeping	See Condition	See Condition	6.B.8, 6.B.9
03	TRE Value (DHT Scrubber Outlet LPA Outlet)	Greater than 1 and less than 4	Record keeping	See Condition	Semiannual	6.B.8, 6.B.9
03	(HPVGTS) VOCs, CO	See Condition	Stack test	Biennial	Biennial	6.B.25
03	LPA (VOCs, CO)	See Condition	Stack test	Biennial	Biennial	6.B.25
03	DHT Scrubber (VOCs, CO)	See Condition	Stack test	Biennial	Biennial	6.B.25
03	VOCs	LDAR	Record keeping	See Condition	Semiannual	6.B.56, 6.B.57
04	Pressure Crystallizer Vent Scrubber (CM-301)	See Condition (CAM)	Record keeping	At least once per day Daily	Semiannual	6.B.21, 6.B.24

**TABLE 6.1 MONITORING AND REPORTING**

Unit ID	Pollutant/Parameter	Limit	Required Monitoring	Monitoring Frequency	Reporting Frequency	Condition Number
04	Pressure drop (Day Silo Bag Filters CM-603A & B)	See Condition	Record keeping	Daily	Semiannual	6.B.17
04	Pressure drop (Dust Collectors CM-608 A & B)	See Condition	Record keeping	Daily	Semiannual	6.B.17
05	Liquid flow rate (Intermediate Silos Vent Scrubber DT-500)	See Condition	Record keeping	Daily	Semiannual	6.B.18
05	CR#2 Low Pressure Absorber (DT-302)	See Condition (CAM)	Record keeping	Continuously with daily average	Semiannual	6.B.22, 6.B.24
05	CR#2 CRU Evaporator Overhead Condenser (DE-416)	See Condition	Record keeping	Daily	Semiannual	6.B.19
06	Vent Header Flow (Crystallizer Vent Scrubber DM-601/DE-601)	See Condition (CAM)	Record keeping	Continuously with daily average	Semiannual	6.B.23, 6.B.24
06	Pressure drop (Day Silo Dust Collectors DM-797 A/B)	See Condition	Record keeping	Daily	Semiannual	6.B.17
05-06	Inlet temperature (CR#2 HPVGTS)	See Condition (HON)	Record keeping	Continuously with daily average	Semiannual	6.B.10-6.B.16
05-06	Calculated AT (CR#2 HPVGTS)	See Condition (HON)	Record keeping	Continuously with daily average	Semiannual	6.B.10-6.B.16
05-06	(CR#2 HPVGTS) Effluent pH	See Condition (HON)	Record keeping	Continuously with daily average	Semiannual	6.B.10-6.B.16

**TABLE 6.1 MONITORING AND REPORTING**

Unit ID	Pollutant/Parameter	Limit	Required Monitoring	Monitoring Frequency	Reporting Frequency	Condition Number
05-06	Liquid to gas ratio (gallons/sec) (CR#2-HPVGTS)	See Condition (HON)	Record keeping	Continuously with daily average	Semiannual	6.B.10-6.B.16
05-06	Calculated delta T (CR#2-HPVGTS)	CAM Presumptive Monitoring (HON) See condition CAM	See HON monitoring Record keeping	Continuously with daily average See HON monitoring	See HON monitoring Semiannual	6.B.22, 6.B.24
05	Inlet temperature (CR#2-HPVGTS)	See Condition (CAM)	Record keeping	Continuously with daily average	Semiannual	6.B.22, 6.B.24
05	HPVGTS (VOCs)	See Condition	Record keeping	Biennial 36 months	Biennial 36 months	6.B.25
03-06	VOCs	Less than 1825 TPY	See Condition	See Condition	See Condition	6.B.26
05-06	VOCs	See Condition	See Condition	See Condition	See Condition	6.B.33
07	Pressure drop (Loading spout dust collectors CM-705A, B & C)	See Condition	Record keeping	Daily	Semiannual	6.B.17
07	Pressure drop (Truck Loading Dust collectors CM-722)	See Condition	Record keeping	Daily	Semiannual	6.B.17
07	Pressure drop (Shipping Storage Silo Dust collectors CM-701 A-E)	See Condition	Record keeping	Daily	Semiannual	6.B.17
07	Pressure drop (Shipping Storage Silo Dust collectors CM-720 A/B)	See Condition (CAM)	Record keeping	Continuously with daily average	Semiannual	6.B.23, 6.B.24
11	Hours of operation	See Condition	See Condition	See Condition	Semiannual	6.B.27, 6.B.28
11	Fuel sulfur content	See Condition	See Condition	See Condition	Semiannual	6.B.27, 6.B.28
1AG	Hours of operation	See Condition	See Condition	See Condition	Semiannual	6.B.27, 6.B.28

**TABLE 6.1 MONITORING AND REPORTING**

Unit ID	Pollutant/Parameter	Limit	Required Monitoring	Monitoring Frequency	Reporting Frequency	Condition Number
<u>IAG</u>	<u>Fuel sulfur content</u>	<u>See Condition</u>	<u>See Condition</u>	<u>See Condition</u>	<u>Semiannual</u>	<u>6.B.27, 6.B.28</u>
03-06, 12	HAPs	Per 40 CFR 63.112	Record keeping	See Condition	See Condition	6.B.29, 6.B.31-6.B.34
13	HAPs	Per 40 CFR 63.112	Record keeping	See Condition	See Condition	6.B.30
<u>15-16</u>	<u>Opacity</u>	<u>20%</u>	<u>COMS Source test (Based on NSPS Subpart Db)</u>	<u>Continuous Initial and annual RATA test</u>	<u>Quarterly within 30 days of test</u>	<u>6.B.39</u>
<u>15-16</u>	<u>PM (fuel oil consumption)</u>	<u>18,675,000 2,400,000 gallons per year each boiler</u>	<u>Record keeping</u>	<u>Daily</u>	<u>Semiannual</u>	<u>6.B.36</u>
15-16	fuel oil sulfur content	0.5% sulfur by weight	Record keeping	Daily	Semiannual	6.B.36, 6.B.45, 6.B.46
15-16	PM	0.6 lb/10 <sup>6</sup> Btu of heat input each (3- hour average)	fuel supplier certification, and fuel oil consumption records will be maintained	Daily	Semiannual	6.B.36
<u>15-16</u>	<u>PM</u>	<u>50.9 TPY (for both boilers combined- 12-month rolling sum)</u>	<u>Calculate a twelve-month rolling sum using stack test data, sulfur content, and fuel consumption records.</u>	<u>Monthly</u>	<u>Semiannual</u>	<u>6.B.37</u>
<u>15-16</u>	<u>PM</u>	<u>50.9 TPY (for both boilers combined- 12-month rolling sum)</u>	<u>Initial then biennial PM stack tests</u>	<u>Initial then biennial</u>	<u>Biennial</u>	<u>6.B.38</u>
<u>15-16</u>	<u>PM<sub>10</sub></u>	<u>50.9 TPY (for both boilers combined- 12-month rolling sum)</u>	<u>Initial then biennial PM stack tests</u>	<u>Initial then biennial</u>	<u>Biennial</u>	<u>6.B.38</u>
<u>15-16</u>	<u>PM</u>	<u>0.03 lb/10<sup>6</sup> Btu of heat input each (3-hr average)</u>	<u>Record-keeping</u>	<u>Daily</u>	<u>NOCS submittal then Semiannual</u>	<u>6.B.47</u>
15-16	SO <sub>2</sub>	3.5 lb/10 <sup>6</sup> Btu of heat input each (24-hour average)	fuel supplier certification, and fuel oil consumption records will be maintained	Daily	Semiannual	6.B.36



**TABLE 6.1 MONITORING AND REPORTING**

Unit ID	Pollutant/Parameter	Limit	Required Monitoring	Monitoring Frequency	Reporting Frequency	Condition Number
15-16	SO <sub>2</sub>	733.4 TPY (for both boilers combined 12-month rolling sum)	An initial stack test only, fuel supplier certification, and fuel oil consumption records will be maintained	Monthly	Semiannual	6.B.37, 6.B.38
15-16	NO <sub>x</sub>	0.10 lb/10 <sup>6</sup> Btu of heat input (30 day average)	Continuous nitrogen oxides monitor will be installed for NO <sub>x</sub> -SIP call these monitors can also be used to meet the NSPS requirements for NO <sub>x</sub>	Continuous (30 day average)	Quarterly	6.B.40, 6.B.41-6.B.44
15-16	NO <sub>x</sub>	317.0 TPY for both boilers combined (12-month rolling sum)	Calculate a twelve-month rolling sum using stack test data	Monthly	Semiannual	6.B.37
15-16	CO	299.6 TPY, for both boilers combined (12-month rolling sum)	Calculate a 12-month rolling sum using stack test or Continuous Emissions Monitoring System	Monthly	Semiannual	6.B.37
15-16	CO	400 ppm by volume on a dry basis corrected to a 3% oxygen (30-day average)	CO continuous monitoring is required by the Boiler MACT Standard	Continuous (30-day average)	NOCS submittal then semiannual	6.B.49-6.B.50
15-16	Hydrogen Chloride	0.0005 lb/10 <sup>6</sup> Btu of heat input (30-day average)	Fuel mixture monitoring	Initial compliance demonstration and monthly monitoring	Semiannual	6.B.47-6.B.48
15-16	NO <sub>x</sub> , heat input, flow	As specified	CEMS	Continuous during control period	Quarterly	6.B.51-6.B.54
15-16	Used oil	See Condition	See Condition	Used oil analysis	Semiannual	6.B.4, 6.B.5
Facility-wide	Temporary units	See condition	See Condition	See Condition	See Condition	6.B.55

N/A = Not Applicable

## B. MONITORING AND REPORTING CONDITIONS

Condition Number	Conditions
6.B.1	<p>Emission Unit 01-14</p> <p>Unless otherwise specified in a more specific requirement, all monitoring shall be performed as follows:</p> <ol style="list-style-type: none"><li>For control devices that have a monitoring frequency specified as “continuously with daily average”, at least one data point shall be obtained each 15-minute period and all data points collected within a 24-hour period (during those times that the process or emissions generating equipment was being operated) shall be averaged together for a daily reading for comparison to an established monitoring range.</li><li>For control devices that have a monitoring frequency specified as “daily reading”, at least one reading will be taken in a 24-hour period (during a time that the process or emissions generating equipment was operating) for comparison to an established monitoring range. However, more than one reading may be taken in a 24-hour period (during a time that the process or emission generating equipment was operating) and all readings taken in the 24-hour period shall be averaged together for a daily reading for comparison to an established parameter.</li></ol>
6.B.2	<p>To assure compliance with the opacity limitations, the permittee shall comply with the following requirement:</p> <p>The permittee shall perform a visual inspection on a semiannual basis. Visual Inspection means a qualitative observation of opacity during daylight hours where the inspector records results in a log, noting color, duration, density (heavy or light), cause and corrective action taken for any abnormal emissions. The observer does not need to be certified to conduct valid visual inspections. However, at a minimum, the observer should be trained and knowledgeable about the effects on visibility of emissions caused by background contrast, ambient lighting, and observer position relative to lighting, wind, and the presence of uncombined water. No periodic monitoring for opacity will be required during periods of burning natural gas or propane only. Logs shall be kept to record all visual inspections, including cause and corrective action taken for any abnormal emissions and visual inspections from date of recording. The logs shall be maintained for a period of five (5) years and be made available to the Department upon request. The owner/operator shall submit semiannual reports to the Manager of the Technical Management Section, Bureau of Air Quality postmarked no later than 30 calendar days after the end of the reporting period.</p>
6.B.3	<p>All records required under this Part 70 operating shall be maintained on site for a period of at least five (5) years and made available to Department personnel upon request.</p> <p>This permit contains compliance certification, testing, monitoring, reporting, and record keeping requirements sufficient to assure compliance with the terms and conditions of this permit. All submittals required by these conditions shall be sent to the South Carolina Department of Health and Environmental Control - Bureau of Air Quality (SC DHEC - BAQ) at the following address:</p> <p style="text-align: center;"><b>SC DHEC - BAQ Technical Management Section 2600 Bull Street Columbia, SC 29201</b></p> <p>The semi-annual monitoring reports required by this permit must be submitted within 60 days of the end of the monitoring period to the above address.</p>

Condition Number	Conditions																
6.B.4	Emission Unit 15-16 The content of the on-site generated spec used oil shall meet the definition of used oil as defined by Section 1, definition 83, of SC Regulation 61-62.1. A sample of the used oil will be analyzed semiannually for specification used oil metals and sulfur content. A summary of these used oil analyses shall be submitted on an semiannual basis.																
6.B.5	Emission Unit 15-16 Because of the nature of the waste gas that is routed to the boilers stack testing will not be required for compliance with Standard No. 3 at this time. This is a State only enforceable requirement.																
6.B.6	Unit ID 03 For the DHT Scrubber, the owner/operator shall continue to operate, and maintain, liquid flowmeters for the first stage inlet (water), liquid flowmeters for the second stage (acetic acid) and a scrubbing liquid inlet temperature gauge for the second stage as appropriate on each scrubber module. All gauges shall be readily accessible for verification by operating personnel and Department personnel (i.e., on ground level or easily accessible roof level). Each parameter shall be recorded continuously (i.e., at least every fifteen minutes) during source operation and shall be made available to Department personnel upon request. The readings shall be maintained in logs (written or electronic (i.e., computerized data system)), along with any corrective action taken when deviations occur. Operational ranges for the monitored parameters have been established to provide a reasonable assurance of compliance. These operational ranges for the monitored parameters were derived from stack test data, vendor certification, and/or operational history and visual inspections, which demonstrate the proper operation of the equipment in compliance. These ranges may be updated using this procedure, following Bureau approval. Scrubber monitoring data shall be maintained on site for a period of at least five (5) years from the date generated and shall be made available to Department personnel upon request. Each incidence of operation outside these operational ranges, including date and time, cause, and corrective action taken, shall be recorded and kept on-site for five (5) years. Exceedance of operational range shall not be considered a violation of an emission limit of this permit, unless the exceedance is also accompanied by other information demonstrating that a violation of an emission limit has taken place. Semiannual reports of these incidences shall be submitted. If no incidences occurred during the reporting period then a letter shall indicate such.																
6.B.7	Unit ID 03 The actual monthly production for the CR #1 Ox Unit will be recorded and used to calculate a rolling 12-month sum. These production records, calculations, and calculation results will be submitted on a semi-annual basis. The production rates, along with stack test data, other Bureau approved emission factors and/or control efficiencies and site specific factors will be used to calculate the CO and VOC annual (12-month rolling sum) emissions for the LPA, HPVGTS, and the DHT Scrubber.																
	Condition 6.B.7 Voided																
6.B.8	<table><tr><td colspan="4">The Process Vent at BT-401 (CR#1 High Pressure Absorber) shall comply with the applicable monitoring, recordkeeping and reporting requirements of 40 CFR 63.</td></tr><tr><td>Equipment</td><td>Control or Recovery Device</td><td>Group Classification</td><td>TRE Index</td></tr><tr><td>Air Oxidation Reactors (BR-301-A-D)</td><td>CR#1 High Pressure Absorber (Recovery Device)</td><td>2</td><td>Greater than 4.0</td></tr><tr><td>Dehydration Tower/Entrainer Tower (BT/701/BE-706BT-750)</td><td>CR#1 High-Low Pressure Absorber (Recovery Device)</td><td>2</td><td>Greater than 4.01.0</td></tr></table>	The Process Vent at BT-401 (CR#1 High Pressure Absorber) shall comply with the applicable monitoring, recordkeeping and reporting requirements of 40 CFR 63.				Equipment	Control or Recovery Device	Group Classification	TRE Index	Air Oxidation Reactors (BR-301-A-D)	CR#1 High Pressure Absorber (Recovery Device)	2	Greater than 4.0	Dehydration Tower/Entrainer Tower (BT/701/BE-706BT-750)	CR#1 High-Low Pressure Absorber (Recovery Device)	2	Greater than 4.01.0
The Process Vent at BT-401 (CR#1 High Pressure Absorber) shall comply with the applicable monitoring, recordkeeping and reporting requirements of 40 CFR 63.																	
Equipment	Control or Recovery Device	Group Classification	TRE Index														
Air Oxidation Reactors (BR-301-A-D)	CR#1 High Pressure Absorber (Recovery Device)	2	Greater than 4.0														
Dehydration Tower/Entrainer Tower (BT/701/BE-706BT-750)	CR#1 High-Low Pressure Absorber (Recovery Device)	2	Greater than 4.01.0														

Condition Number	Conditions
6.B.9	<p>a. For the Group 2 Process Vent at BT-401 (CR#1 High Pressure Absorber), which includes emissions from the Air Oxidation Reactors (BR-301-<del>A-D</del>) and Dehydration Tower (<del>BT-701/BE-706</del>) - Pursuant to 40 CFR 63.113 (e), the permittee shall maintain a TRE greater than 4.0 and comply with the following requirements:</p> <ul style="list-style-type: none"> <li>i. Provisions for calculating TRE index in 40 CFR 63.115.</li> <li>ii. Reporting and record keeping provisions in 40 CFR 63.117(b), 63.118(c), and 63.118(h).</li> </ul> <p>b. The owner or operator of a Group 2 process vent with a TRE index greater than 4.0 as specified in §63.113(e), shall maintain records of measurements, engineering assessments, and calculations performed to determine the TRE index value of the vent stream. Documentation of engineering assessments shall include all data, assumptions, and procedures used for the engineering assessments, as specified in §63.115(d)(1).</p> <p>c. The owner or operator who elects to demonstrate compliance with the TRE index value greater than 4.0 under §63.113(e) shall keep up-to-date, readily accessible records of:</p> <ul style="list-style-type: none"> <li>i. Any process changes as defined in §63.115(e); and</li> <li>ii. Any recalculation of the TRE index value pursuant to §63.115(e).</li> </ul> <p>d. Whenever a process change, as defined in §63.115(e), is made that causes a Group 2 process vent with a TRE greater than 4.0 to become a Group 2 process vent with a TRE less than 4.0, the owner or operator shall submit a report within 180 calendar days after the process change. The report may be submitted as part of the next periodic report. The report shall include:</p> <ul style="list-style-type: none"> <li>i. A description of the process change,</li> <li>ii. The results of the recalculation of the TRE index value required under §63.115(e) and recorded under paragraph (c) of §63.118, and</li> <li>iii. A statement that the owner or operator will comply with the requirements specified in §63.113(d).</li> <li>iv. The owner or operator of a source subject to Subpart G shall submit Periodic Reports. Except as specified under paragraphs (c)(5) and (c)(6) of section §63.152, reports containing information in paragraphs 63.152(c)(2), (c)(3), and (c)(4) shall be submitted semi-annually no later than 60 calendar days after the end of each 6-month period.</li> </ul> <p>e. For the Group 2 Process Vent at BT-<del>702-603</del> (CR#1 <del>DHT-Scrubber</del>Low Pressure Absorber), which includes emissions from the Dehydration Tower (BT-701/<del>BE-706</del>) and Entrainer Tower (BT-750) - Pursuant to 40 CFR 63.113 (e), the permittee shall maintain a TRE between 1.0 and 4.0 and comply with the following requirements:</p> <ul style="list-style-type: none"> <li>i. Provisions for calculating TRE index in 40 CFR 63.115.</li> <li>ii. Monitoring of recovery device parameters per provisions of 40 CFR 63.114(b) using the alternate parameters approved by DHEC in a letter of August 11, 2003.</li> <li>iii. Reporting and record keeping provisions in 40 CFR 63.117(b), 63.118(c), and 63.118(h)</li> </ul>

Condition Number	Conditions				
6.B.10	The Control Device CR#2 HPVGTs shall comply with the monitoring, recordkeeping and reporting requirements of 40 CFR 63.				
	Equipment	Control Device	Group Classification	Reduction Required	
	High Pressure Absorber	HPVGTS	1	98 weight % or to a concentration of 20 ppm by volume	
	Dehydration Tower	HPVGTS	1	98 weight % or to a concentration of 20 ppm by volume	
	Reactors DR-106 A/B	HPVGTS	1	98 weight % or to a concentration of 20 ppm by volume	
	1st Crystallizer DD201	HPVGTS	1	98 weight % or to a concentration of 20 ppm by volume	
6.B.11	The table below is a summary of the monitoring and reporting required for Emission Units 05-06 per 40 CFR 63:				
	Emission Unit	Parameter	Monitoring Frequency	Averaging time	Condition
	05-06	Inlet temperature (HPVGTS oxidizer)	Continuously	Daily	6.B.13-6.B.17
	05-06	Calculated Delta T (HPVGTS oxidizer)	Continuously	Daily	6.B.13-6.B.17
	05-06	Effluent pH (HPVGTS scrubber)	Continuously	Daily	6.B.13-6.B.17
	05-06	Liquid to gas ratio (gallons/sec) (HPVGTS scrubber)	Continuously	Daily	6.B.13-6.B.17
	The owner or operator of a HON Group 1 process vent shall reduce emissions of total organic hazardous air pollutants by 98 weight percent or to a concentration of 20 parts per million by volume, whichever is less stringent. For combustion devices, the emission reduction or concentration shall be calculated on a dry basis, corrected to 3 percent oxygen, and compliance can be determined by measuring either organic hazardous air pollutants or total organic carbon using the procedures in §63.116 of Subpart G.				
	Halogenated Group 1 process vent streams that are combusted (controlled by combustion control device) shall be ducted to a halogen reduction device, including but not limited to a scrubber, before it is discharged to the atmosphere. The halogen reduction device shall reduce overall emissions of hydrogen halides and halogens, as defined in §63.111 of subpart G, by 99 percent or shall reduce the outlet mass of total hydrogen halides and halogens to less than 0.45 kilogram per hour, whichever is less stringent.				

Condition Number	Conditions
6.B.12	<p>Each owner or operator of a HON Group 1 process vent that uses a combustion device to comply with the requirements in §63.113 (a)(2) of subpart G, shall install monitoring equipment specified below. All monitoring equipment shall be installed, calibrated, maintained, and operated according to manufacturer's specifications or other written procedures that provide adequate assurance that the equipment would reasonably be expected to monitor accurately.</p> <p>i.) For the catalytic oxidizer (DR-1814), temperature monitoring devices shall be installed in the gas stream immediately before and after the catalyst bed.</p> <p>ii.) For the bromine scrubber (DT-1821), the following monitoring equipment is required for the scrubber:</p> <p>A.) A pH-monitoring device equipped with a continuous recorder shall be installed to monitor the pH of the scrubber effluent.</p> <p>B.) A flow meter equipped with a continuous recorder shall be located at the scrubber influent for liquid flow. Gas stream flow shall be determined using one of the procedures specified as follows:</p> <p>1. The owner or operator may determine gas stream flow using the design blower capacity, with appropriate adjustments for pressure drop.</p> <p>2. The owner or operator may prepare and implement a gas stream flow determination plan that documents an appropriate method which will be used to determine the gas stream flow. The plan shall require determination of gas stream flow by a method which will at least provide a value for either a representative or the highest gas stream flow anticipated in the scrubber during representative operating conditions other than start ups, shutdowns, or malfunctions. The plan shall include a description of the methodology to be followed and an explanation of how the selected methodology will reliably determine the gas stream flow, and a description of the records that will be maintained to document the determination of gas stream flow. The owner or operator shall maintain the plan as specified in §63.103(e).</p>
6.B.13	<p>The owner or operator of a process vent using a vent system that contains bypass lines that could divert a vent stream away from the control device used to comply with §63.113(a)(2) of subpart G shall comply with the paragraphs shown below. Equipment such as low leg drains, high point bleeds, analyzer vents, open ended valves or lines, and pressure relief valves needed for safety purposes are not subject to this paragraph.</p> <p>i.) Properly install, maintain, and operate a flow indicator that takes a reading at least once every 15 minutes. Records shall be generated as specified in §63.118(a)(3) of subpart G. The flow indicator shall be installed at the entrance to any bypass line that could divert the vent stream away from the control device to the atmosphere; or</p> <p>ii.) Secure the bypass line valve in the non-diverting position with a car-seal or a lock-and-key type configuration. A visual inspection of the seal or closure mechanism shall be performed at least once every month to ensure that the valve is maintained in the non-diverting position and the vent stream is not diverted through the bypass line.</p> <p>iii.) Maintain a continuous record of valve (by pass valve) position as a means to determine a by-pass condition. The valves (by pass valves) are either fully open or fully closed and are not designed to regulate or adjust flow. The positions of the valves (open or closed) can be confirmed on a continuous basis by limit switches via a Distributive Control System (DCS). These limit switches will be maintained and tested in accordance with the manufacturer's recommendations.</p>

Condition Number	Conditions
6.B.14	<p><del>Each owner or operator subject to the control provisions for Group 1 vent shall keep an up-to-date, readily accessible record of the following data:</del></p> <p><del>i.) If any subsequent TRE determinations or performance tests are conducted after the Notification of Compliance Status (NCS) has been submitted, report the data in paragraphs (a)(4) through (a)(8) of §63.117 in the next Periodic Report as specified in §63.152(e) of this subpart.</del></p> <p><del>ii.) Record and report the following in the NCS when using a combustion device to achieve a 98 weight percent reduction in organic HAP or an organic HAP concentration of 20 parts per million by volume, as specified in §63.113(a)(2) of this subpart:</del></p> <p><del>A.) The parameter monitoring results for catalytic oxidizer (DR-1814) specified in Table 3 of subpart G, and averaged over the same time period of the performance testing;</del></p> <p><del>B.) For an incinerator, the percent reduction of organic HAP or TOC achieved by the incinerator determined as specified in §63.116(e) of this subpart, or the concentration of organic HAP or TOC (parts per million by volume, by compound) determined as specified in §63.116(e) of this subpart at the outlet of the incinerator on a dry basis corrected to 3 percent oxygen.</del></p> <p><del>iii.) Record and report the following in the NCS when using a scrubber following a combustion device to control a halogenated process vent stream:</del></p> <p><del>A.) The percent reduction or scrubber outlet mass emission rate of total hydrogen halides and halogens as specified in §63.116(d) of Subpart G;</del></p> <p><del>B.) The pH of the scrubber effluent; and</del></p> <p><del>C.) The scrubber liquid to gas ratio; and</del></p> <p><del>iv.) Record and report in the NCS the halogen concentration in the process vent stream determined according to the procedures specified in §63.115(d)(2)(v) of subpart G.</del></p>

Condition Number	Conditions
6.B.15	<p><del>Each owner or operator using a control device to comply with §63.113 (a)(2) of subpart G shall keep the following records up to date and readily accessible:</del></p> <p><del>i.) Continuous records of the equipment operating parameters specified to be monitored under §63.114(a) of this subpart and listed in table 3 of this subpart or specified by the Administrator in accordance with §63.114(c) and §63.117(e) of this subpart.</del></p> <p><del>ii.) Records of the daily average value of each continuously monitored parameter for each operating day determined according to the procedures specified in §63.152(f).</del></p> <p><del>iii.) The daily average shall be calculated as the average of all values for a monitored parameter recorded during the operating day, except as provided in paragraph (a)(2)(ii) of §63.118. The average shall cover a 24 hour period if operation is continuous, or the number of hours of operation per operating day if operation is not continuous.</del></p> <p><del>iv.) Monitoring data recorded during periods of monitoring system breakdowns, repairs, calibration checks, and zero (low level) and high level adjustments shall not be included in computing the hourly or daily averages. Records shall be kept of the times and durations of all such periods and any other periods of process or control device operation when monitors are not operating.</del></p> <p><del>v.) The operating day shall be the period from midnight to midnight.</del></p> <p><del>vi.) If all recorded values for a monitored parameter during an operating day are within the range established in this Part 70 operating permit, the owner or operator may record that all values were within the range rather than calculating and recording a daily average for that operating day.</del></p> <p><del>vii.) Hourly records of whether the flow indicator specified under §63.114(d)(1) of Subpart G was operating and whether flow was detected at any time under the hour, as well as records of the times and durations of all periods when the vent stream is diverted from the control device or the monitor is not operating.</del></p> <p><del>viii.) Where a seal mechanism is used to comply with §63.114(d)(2) of subpart G, hourly records of flow are not required. In such cases, the owner or operator shall record that the monthly visual inspection of the seals or closure mechanism has been done, and shall record the duration of all periods when the seal mechanism is broken, the bypass line valve position has changed, or the key for a lock and key type lock has been checked out, and records of any ear seal that has broken.</del></p>



Condition Number	Conditions
6.B.16	<p>Each owner or operator who elects to comply with the requirements of §63.113 of this subpart shall submit to the Administrator Periodic Reports semi-annually no later than 60 calendar days after the end of each 6-month period of the following recorded information according to the schedule in §63.152 of this subpart:</p> <ul style="list-style-type: none"> <li>i. Reports of daily average values of monitored parameters for all operating days when the daily average values recorded under paragraphs (a) and (b) of this section were outside the ranges established in this Part 70 operating permit.</li> <li>ii. <del>For Group 1 points, reports of the duration of periods when monitoring data is not collected for each excursion caused by insufficient monitoring data as defined in §63.152(e)(2)(ii)(A) of subpart G.</del></li> <li>iii. <del>Reports of the times and durations of all periods recorded under paragraph (a)(3) of §63.118 when the vent stream is diverted from the control device through a bypass line.</del></li> <li>iv. <del>Reports of all periods recorded under paragraph (a)(4) of §63.118 in which the seal mechanism is broken, the bypass line valve position has changed, or the key to unlock the bypass line valve was checked out</del></li> </ul>
6.B.17	<p>For 603 A &amp; B, CM-608 A &amp; B, DM-797 A/B, CM-705A, B &amp; C, CM-722, and CM-701 A-E, the owner/operator shall continue to operate and maintain pressure drop gauge(s) on each module of the baghouse(s). Pressure drop readings shall be recorded daily during source operation.</p> <p>Operational ranges for the monitored parameters have been established to provide a reasonable assurance of compliance. These operational ranges for the monitored parameters were derived from stack test data, vendor certification, and/or operational history and visual inspections, which demonstrate the proper operation of the equipment in compliance. The facility shall maintain previously established operational ranges for these monitored parameters. The operating ranges may be updated using this procedure, following submittal to the Bureau.</p>
6.B.18	<p>For DT-500, the owner/operator shall continue to operate, and maintain liquid flow meters on each scrubber module. Each parameter shall be recorded daily during source operation.</p> <p>Operational ranges for the monitored parameters have been established to provide a reasonable assurance of compliance. These operational ranges for the monitored parameters were derived from stack test data, vendor certification, and/or operational history and visual inspections, which demonstrate the proper operation of the equipment in compliance. The facility shall maintain the established operational ranges for these monitored parameters. The operating ranges may be updated using this procedure, following submittal to the Bureau.</p>
6.B.19	<p><del>For Condenser BE 645 and CR#2 CRU Evaporator Overhead Condenser (DE 416), the owner/operator shall continue to operate and maintain outlet coolant temperature gauges on each condenser. Each parameter shall be recorded daily during source operation.</del></p> <p><del>Operational ranges for the monitored parameters have been established to provide a reasonable assurance of compliance. These operational ranges for the monitored parameters were derived from stack test data, vendor certification, and/or operational history and visual inspections, which demonstrate the proper operation of the equipment in compliance. The facility shall maintain the established operational ranges for these monitored parameters. The operating ranges may be updated using this procedure, following Bureau approval.</del></p>

Condition Number	Conditions					
6.B.20	To meet the requirements of 40 CFR 64 the owner/operator shall install, operate and maintain the indicators shown below as the measurement approach:					
	Control Device (Emission Unit )	Applicable Requirement	Indicator and Indicator Location	Monitoring & Reporting Frequency	Range	Excursion
	CR#1 Low Pressure Absorber (BT-603)	SC Re. 61-62.1, Sec II (H) (1825 TPY VOC) BACT LIMIT	Scrubbing fluid flow rate and absorber top temperature will be monitored with flow meter and thermocouple	Monitored continuously and recorded at least once per 15-minutes. A daily average will be calculated from all valid 15-minute monitoring periods and recorded.	> 3.5 gal/min (liquid flow) ≤ 125°F (top temperature)	Occurs when the daily average for the parameter is outside the approved monitoring range or when the number of valid monitoring periods for the parameter is less than 75% of the number of process operating periods in a day.
	CR#1 Intermediate Storage Silo Scrubber (BT-501)	SC Reg. 61-62.1, Sec. II (H) (2.16 lbs/hr of PM)	Liquid top and bottom flow rates will monitored with flow meters	Monitored continuously and recorded at least once per 15-minutes. A daily average will be calculated from all valid 15-minute monitoring periods and recorded.	Single Transfer > 18 gallons per minute (top water spray)  > 120 gallons per minute (bottom water spray)  Double Transfer > 90 gallons per minute (top water spray)  > 95 gallons per minute (bottom water spray)	Occurs when the daily average for the parameter is outside the approved monitoring range or when the number of valid monitoring periods for the parameter is less than 75% of the number of process operating periods in a day.
	<p>All indicator measuring instruments shall be readily accessible for verification by operating personnel and Department personnel (i.e. on ground level or easily accessible roof level).</p> <p>These operational ranges for the monitored parameters were derived from stack test data, which demonstrate the proper operation of the equipment in compliance.</p>					

Condition Number	Conditions					
6.B.21	To meet the requirements of 40 CFR 64 the owner/operator shall install, operate and maintain the indicators shown below as the measurement approach:					
	Control Device (Emission Unit 03)	Applicable Requirement	Indicator and Indicator Location	Monitoring & Reporting Frequency	Range	Excursion
	High Pressure Vent Gas Treatment System CR#1 (non-HON source)	SC Reg. 61-62.1 Section II (H) CO limit of <del>1452 lbs/hr</del> and <del>375 TPY</del> <b>BACT limits</b>	Inlet T and delta T across the catalytic oxidizer will be monitored with thermo-couples	Monitored continuously and recorded at least once per 15-minutes. A daily average will be calculated from all valid 15-minute monitoring periods and recorded.	Inlet temperature and Delta Temperature <sup>1</sup>	Occurs when the daily average for the parameter is outside the approved monitoring range or when the number of valid monitoring periods for the parameter is less than 75% of the number of process operating periods in a day.
	CR#1 Crystallizer Vent Scrubber (CM-301)	SC Reg. 61-62.1 Standard No. 4 (56.05 lbs/hr of PM for Emission Units 03-04)	Scrubber pressure will be monitored	Monitor at least once per day	<0.5 inches of water	Occurs when the parameter is outside the approved monitoring range
	High Pressure Vent Gas Treatment System CR#1 (non-HON source)	SC Reg. 61-62.1 Section II (H) <del>1825 TPY</del> of VOC for Emission Units 03-06 & HPVGTS <del>VOC limit of 85 lbs/hr and 80 TPY</del> <b>BACT Limits</b>	Inlet T and delta T across the catalytic oxidizer will be monitored with thermo-couples	Monitored continuously and recorded at least once per 15-minutes. A daily average will be calculated from all valid 15-minute monitoring periods and recorded.	Inlet temperature and Delta Temperature <sup>1</sup>	Occurs when the daily average for the parameter is outside the approved monitoring range or when the number of valid monitoring periods for the parameter is less than 75% of the number of process operating periods in a day.
<p><sup>1</sup>The catalytic oxidizer shall be operated within the approved temperature range, determined by contemporaneous source test data. Source testing shall be required upon installation of a new catalyst, and at least once per 24-month period thereafter (consistent with Condition 6.B.25) , for the lifetime of the catalyst.</p> <p>This temperature requirement does not apply during testing itself. On-site records and submitted reports must include appropriate information regarding testing to justify temperature abnormalities during testing. Failure to include this information will nullify this exception.</p> <p>If a source test fails or the data is otherwise compromised, the previous successful source test data shall be used to determine the acceptable temperature range. A new source test shall be performed as soon as practicable, in accordance with the testing frequency requirement.</p> <p>All indicator measuring instruments shall be readily accessible for verification by operating personnel and Department personnel (i.e. on ground level or easily accessible roof level).</p> <p>These operational ranges for the monitored parameters were derived from stack test data, which demonstrate the proper operation of the equipment in compliance.</p>						

Condition Number	Conditions					
6.B.22	To meet the requirements of 40 CFR 64 the owner/operator shall install, operate and maintain the indicators shown below as the measurement approach:					
	Control Device (Emission Unit)	Applicable Requirement	Indicator and Indicator Location	Monitoring & Reporting Frequency	Range	Excursion
	CR#2 Low Pressure Absorber (DT-302)	SC Re. 61-62.1, Sec II (H) (1825 TPY VOC for Emission Units 03-06) BACT Limit	Scrubbing fluid flow top and bottom will be monitored with flow meters.	The top and bottom fluid flows will be monitored continuously and recorded at least once per 15-minutes. A daily average will be calculated from all valid 15-minute monitoring periods and recorded.	> 1 gpm (top water reflux) > 23 gpm (bottom acid reflux)	Occurs when the daily average for the parameter is outside the approved monitoring range or when the number of valid monitoring periods for the parameter is less than 75% of the number of process operating periods in a day.
	High Pressure Vent Gas Treatment System CR#2	SC Reg. 61-62.1 Section II (H) 1825 TPY of VOC for Emission Units 03-06	Inlet T and delta T across the catalytic oxidizer will be monitored with thermocouples Presumptive CAM monitoring (HON)	Monitored continuously and recorded at least once per 15-minutes. A daily average will be calculated from all valid 15-minute monitoring periods and recorded Presumptive CAM monitoring (HON)	Inlet temperature and Delta Temperature Presumptive CAM monitoring (HON)	Occurs when the daily average for the parameter is outside the approved monitoring range or when the number of valid monitoring periods for the parameter is less than 75% of the number of process operating periods in a day Presumptive CAM monitoring (HON)
All indicator measuring instruments shall be readily accessible for verification by operating personnel and Department personnel (i.e. on ground level or easily accessible roof level).						
These operational ranges for the monitored parameters were derived from stack test data, which demonstrate the proper operation of the equipment in compliance.						

Condition Number	Conditions					
6.B.23	To meet the requirements of 40 CFR 64 the owner/operator shall install, operate and maintain the indicators shown below as the measurement approach:					
	Control Device (Emission Unit)	Applicable Requirement	Indicator and Indicator Location	Monitoring & Reporting Frequency	Range	Excursion
	CR#2 Crystallizer Vent Scrubber (DM-601/DE-601)	SC Reg. 61-62.5 Standard No. 4 (53.67 lbs/hr of PM for Emission Units 05-06)	Scrubber fluid flow rate will be monitored with a flow meter.	The fluid flow rates will be monitored continuously and recorded at least once per 15-minutes. A daily average will be calculated from all valid 15-minute monitoring periods and recorded.	> 180 gallons per minute	Occurs when the daily monitoring parameter is outside the approved monitoring range or when no valid monitoring value is recorded for either parameter when either A or B has been in operation for at least four hours that day.
	S & L Shipping Storage Silo Baghouses (CM-720 A/B-F Silo))	SC Reg. 61-62.5 Standard No. 4 (56.25 lbs/hr of PM for Emission Unit 07	Pressure drop will be monitored with a differential pressure gauge on each baghouse	The pressure drop will be monitored continuously and recorded at least once per 15-minutes. A daily average will be calculated from all valid 15-minute monitoring periods and recorded.	0.2-10 in of water	Occurs when the daily average for the parameter is outside the approved monitoring range or when the number of valid monitoring periods for the parameter is less than 75% of the number of process operating periods in a day.
All indicator measuring instruments shall be readily accessible for verification by operating personnel and Department personnel (i.e. on ground level or easily accessible roof level).						
These operational ranges for the monitored parameters were derived from stack test data, which demonstrate the proper operation of the equipment in compliance.						

Condition Number	Conditions																				
6.B.24	<p>Per 40 CFR 64, an excursion is defined as any operating condition where the indicator is outside of the approved range. Upon detecting an excursion, the owner or operator shall restore operation of the pollutant-specific emissions unit (including the control device and associated capture system) to its normal or usual manner of operation as expeditiously as practicable in accordance with good air pollution control practices for minimizing emissions. The response shall include minimizing any startup, shutdown or malfunction period and taking any necessary corrective actions to restore normal operation and prevent the likely recurrence of the cause of an excursion (other than those caused by excused startup and shutdown conditions).</p> <p>Any alternative method for monitoring control device performance must be preapproved by the Bureau and shall be incorporated into the permit as set forth in SC Regulation 61-62.70.7.</p> <p>A semiannual report for monitoring shall include, at a minimum, the information required under § 70.6(a)(3)(iii) and the following information as applicable:</p> <p>1) Summary information of the number, duration and cause (including unknown cause, if applicable) of excursions, as applicable, and the corrective actions taken;</p> <p>2) Summary information on the number, duration and cause (including unknown cause, if applicable) for monitor downtime incidents (other than downtime associated with zero span or other daily calibration checks, if applicable);</p> <p>3) If applicable, a description of the actions taken to implement a Quality Improvement Plan (QIP) during the reporting period as specified in §64.8. Upon completion of a QIP, the owner or operator shall include in the next summary report documentation that the implementation of the plan has been completed and reduced the likelihood of similar levels of excursions occurring.</p> <p>The owner or operator shall maintain records of monitoring data, monitor performance data, corrective action, and quality improvement plans. Records shall be maintained on site for a period of at least five (5) years from the date generated and shall be made available to Department personnel upon request.</p>																				
6.B.25	<p>The following sources shall be stack tested at least every <del>other year</del><u>36 months</u> per the table below:</p> <table><tr><th>Emission Unit</th><th>Source</th><th>Pollutant</th><th>Testing Frequency</th></tr><tr><td>03</td><td>HPVGTS</td><td>VOC, CO</td><td>Once every <del>24</del><u>36 months</u></td></tr><tr><td>03</td><td>LPA</td><td>VOC, CO</td><td>Once every <del>24</del><u>36 months</u></td></tr><tr><td><del>03</del></td><td><del>DHT Scrubber</del></td><td><del>VOC, CO</del></td><td><del>Once every 24 months</del></td></tr><tr><td>05</td><td>HPVGTS</td><td>VOC</td><td>Once every <del>24</del><u>36 months</u></td></tr></table> <p>The Bureau must be notified at least two weeks prior to a source test so that a Bureau representative may be present. Source test methodology, to include testing at worst-case conditions, must be approved by the Bureau and comply with SC DHEC Regulation 61-62.1, Section IV-Source Testing.</p>	Emission Unit	Source	Pollutant	Testing Frequency	03	HPVGTS	VOC, CO	Once every <del>24</del> <u>36 months</u>	03	LPA	VOC, CO	Once every <del>24</del> <u>36 months</u>	<del>03</del>	<del>DHT Scrubber</del>	<del>VOC, CO</del>	<del>Once every 24 months</del>	05	HPVGTS	VOC	Once every <del>24</del> <u>36 months</u>
Emission Unit	Source	Pollutant	Testing Frequency																		
03	HPVGTS	VOC, CO	Once every <del>24</del> <u>36 months</u>																		
03	LPA	VOC, CO	Once every <del>24</del> <u>36 months</u>																		
<del>03</del>	<del>DHT Scrubber</del>	<del>VOC, CO</del>	<del>Once every 24 months</del>																		
05	HPVGTS	VOC	Once every <del>24</del> <u>36 months</u>																		

Condition Number	Conditions
6.B.26	<p><del>To assure compliance with the VOC emission limitation, the permittee shall comply with the following requirements:</del></p> <p><del>a. Based on the daily production rates, process data (i.e., organic recording device), source test data, and the operation of all recovery and control equipment, the permittee shall calculate and record within fifteen days following a quarter basis the monthly emissions of VOCs and a twelve month rolling sum. The twelve-month rolling sum shall not exceed 1825 TPY. The calculated values shall include the sum of VOC emissions from all uncontrolled and controlled fugitive (i.e. equipment leaks) and point sources plus uncontrolled VOC emission emitted during periods when performing maintenance on any control device.</del></p> <p><del>b. When bypassing any control device during periods of malfunctions, the permittee shall comply with permit condition 4.B.6 of this Part 70 operating permit. If repetitive circumstances or causes of malfunctions are detected, a plan for improving the operations and maintenance of the control device shall be submitted to the Manager of the Technical Management Section, Bureau of Air Quality to address such causes.</del></p> <p><del>c. The VOC calculated total shall be submitted on a semi annual basis.</del></p>
6.B.27	<p>The permittee shall comply with the following requirements:</p> <p>a. The combustion sources included in Condition 6.B.<del>34-28</del> are permitted to burn only #2 virgin fuel oil as a fuel. The sulfur content of the fuel oil burned in each combustion source shall be limited as shown in Condition 6.B.<del>34-28</del>. The use of any other substances as fuel is prohibited without prior written approval from the Bureau of Air Quality. Fuel oil analysis (i.e. supplier certification sheet) shall be obtained for each batch of oil received and stored on site. The supplier certification shall be maintained on-site for five years.</p> <p>b. The operating time of each combustion source shall be limited as shown in Condition 6.B.28 on a twelve-month rolling sum.</p> <p>Per combustion source, the permittee for each month must record the actual operating hour meter reading and the calculated twelve-month rolling sum. The records of actual operating hours shall be maintained on-site for a period of at least five (5) years.</p> <p>c. In regards to compressors L-1 and L-2, the total rated capacity of two or less diesel powered compressors shall be less than or equal to 5.98 million Btu/hr (2350 HP). The permittee shall maintain appropriate records which demonstrates compliance with this condition. These records shall include, but are not limited to, a copy of the manufacturer's information indicating the rated capacity of each compressor. These records shall be maintained on site for a period of at least five (5) years and shall be made available to a Department representative upon request. The permittee shall notify by phone the local EQC District Office at least a day before replacing and/or adding a compressor. A follow-up letter shall be mailed to the Bureau of Air Quality and the local EQC District Office postmarked at least 2 days after replacing and/or adding a compressor indicating the actual date of installation, the rated capacity of each compressor on site, and the total associated emissions of each criteria pollutant in terms of lbs/hr.</p> <p>BP will prepare a semiannual report to summarize the fuel sulfur content and the hours of operation of the emergency generators, compressors, and pumps per Condition 6.B.<del>34-28</del>.</p>

Condition Number	Conditions																																																																							
6.B.28	The operating hours and percent sulfur contents for the fuel- for the generators, compressors and pumps in Emission Unit 11 <u>and the IAG Informational EU</u> shall be limited as follows:																																																																							
	Equip ID	Combustion Source	No. 2 fuel oil Percent Sulfur	Hrs/yr (non-emergency operation)	AM-804	Emergency Generator #1	<0.3%15 ppm	No limits100	AC-402	Emergency Compressor #1	15 ppm<0.3%	100No limits	AG-202B	Emergency Fire Water Pump	15 ppm<0.3%	100No limits	AG-229	T-Head FW Pump	15 ppm<0.3%	100No limits	AG-202C	Emergency Fire Water Pump	<0.05%	<250	AG-202D	Emergency Fire Water Pump	<0.05%	<250	BM-1201	Emergency Generator #2 (CR#1)	15 ppm<0.3%	100<250	DM-135	Emergency Generator #3 (CR#2)	15 ppm<0.05%	<500	AC-404	Emergency Air Compressor #2 (Utility)	15 ppm<0.05%	<1,000<500	AM-838	IT Emergency Generator	15 ppm<0.5%	<500	L-1 and L-2	(Leased) Compressors #1 and #2	15 ppm<0.05%	8760*	AM-819	Administration Building Emergency Generator	15 ppm	100	AM-840	PX Pump Emergency Generator	15 ppm	100	AM-846	Main Gate Emergency Generator	15 ppm	100	AM-847	Contractor Gate Emergency Generator	15 ppm	100	AM-848	T-Head Emergency Generator	15 ppm	100	AM-849	WWT Control Room Emergency Generator	15 ppm	100
	Equip ID	Combustion Source	No. 2 fuel oil Percent Sulfur	Hrs/yr (non-emergency operation)																																																																				
	AM-804	Emergency Generator #1	<0.3%15 ppm	No limits100																																																																				
	AC-402	Emergency Compressor #1	15 ppm<0.3%	100No limits																																																																				
	AG-202B	Emergency Fire Water Pump	15 ppm<0.3%	100No limits																																																																				
	AG-229	T-Head FW Pump	15 ppm<0.3%	100No limits																																																																				
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	AG-202D	Emergency Fire Water Pump	<0.05%	<250																																																																				
	BM-1201	Emergency Generator #2 (CR#1)	15 ppm<0.3%	100<250																																																																				
	DM-135	Emergency Generator #3 (CR#2)	15 ppm<0.05%	<500																																																																				
	AC-404	Emergency Air Compressor #2 (Utility)	15 ppm<0.05%	<1,000<500																																																																				
	AM-838	IT Emergency Generator	15 ppm<0.5%	<500																																																																				
	L-1 and L-2	(Leased) Compressors #1 and #2	15 ppm<0.05%	8760*																																																																				
	AM-819	Administration Building Emergency Generator	15 ppm	100																																																																				
	AM-840	PX Pump Emergency Generator	15 ppm	100																																																																				
	AM-846	Main Gate Emergency Generator	15 ppm	100																																																																				
	AM-847	Contractor Gate Emergency Generator	15 ppm	100																																																																				
	AM-848	T-Head Emergency Generator	15 ppm	100																																																																				
	AM-849	WWT Control Room Emergency Generator	15 ppm	100																																																																				
	Fuel oil analysis (i.e. supplier certification sheet) shall be obtained for each batch of oil received and stored on site. A semiannual report shall be prepared to summarize the fuel sulfur content and the hours of operation.																																																																							
6.B.29	<u>Emission Unit No. 12</u> Each owner or operator of a Group 1 or Group 2 storage vessel shall keep readily accessible records showing the dimensions of a the storage vessel and an analysis showing the capacity of the storage vessel. This record shall be kept as long as the storage vessel retains Group 1 or Group 2 status and is in operation. For each Group 2 storage vessel, the owner or operator is not required to comply with any other provisions of §§63.119 through 63.123 of Subpart G other than those required by this paragraph unless such vessel is part of an emissions average as described in §63.150 of Subpart G.																																																																							
6.B.30	HON wastewater generated is all Group 2 wastewater. Records of the Group 2 status determinations must be kept available for inspection. If the status of the wastewater changes to Group 1, the required notification and capture/destruction system will have to be installed.																																																																							



Condition Number	Conditions
6.B.31	Emission Units 03-06, 12
	The owner /operator of these units is subject to 40 CFR 63 Subpart H, National Emission Standards for Organic Hazardous Air Pollutants for Equipment Leaks. In accordance with 40 CFR 63, Subparts A & H, the owner /operator shall comply with the requirements of all applicable provisions of these subparts. The table below lists equipment categories subject to the provisions of this subpart and the method used to show compliance. <u>All VOC will be considered as a HAP for purposes of determining the components requiring a monitoring program.</u>

Condition Number	Conditions
6.B.32	<p>Emission Units 03-06, 12</p> <p><u>Pumps in Light Liquid Service</u> Each pump shall be checked by visual inspection each calendar week for indicators of liquids dripping from the pump seal. If there are indications of liquids dripping from the pump seal, a leak is detected.</p> <p>A first attempt at repair shall be made no later than 5 calendar days after the leak is detected. First attempts at repair include, but are not limited to, the following practices where practicable:</p> <ol style="list-style-type: none"> <li>i. Tightening of the packing gland nuts.</li> <li>ii. Ensuring that the seal flush is operated at design pressure and temperature.</li> </ol> <p><u>Valves in gas/vapor service and in light liquid service</u></p> <p>When a leak is detected, it shall be repaired as soon as practicable, but no later than 15 calendar days after the leak is detected, except as provided in §63.171.</p> <p>A first attempt to repair shall be made no later than 5 calendar days after each leak is detected. When a leak has been repaired, the valve shall be monitored at least once within the first 3 months after its repair. The monitoring shall be conducted as specified in §63.180b and c as appropriate to determine whether the valve has resumed leaking.</p> <p><u>Pumps, valves, connectors, and agitators in heavy liquid service; instrumentation systems; and pressure relief devices in liquid service</u></p> <ol style="list-style-type: none"> <li>a. Pumps, valves, connectors, and agitators in heavy liquid service, pressure relief devices in light liquid or heavy liquid service, and instrumentation systems shall be monitored within 5 calendar days by the method specified in §63.180(b) if any evidence of a potential leak to the atmosphere is found by visual, audible, olfactory, or any other detection method. If such a potential leak is repaired as required in paragraphs (c) and (d) of this section, it is not necessary to monitor the system for leaks by the method specified in §63.180(b).</li> <li>b. If an instrument reading of 10,000 parts per million or greater for agitators, 5,000 parts per million or greater for pumps handling polymerizing monomers, 2,000 parts per million or greater for pumps in food/medical service or pumps subject to §63.163(b)(iii)(C), or 500 parts per million or greater for valves, connectors, instrumentation systems, and pressure relief devices is measured, a leak is detected.</li> <li>c. When a leak is detected, it shall be repaired as soon as practicable, but not later than 15 calendar days after it is detected, except as provided in §63.171. The first attempt at repair shall be made no later than 5 calendar days after each leak is detected.  For equipment identified in paragraph (a) of this section that is not monitored by the method specified in §63.180(b), repaired shall mean that the visual, audible, olfactory, or other indications of a leak to the atmosphere have been eliminated; that no bubbles are observed at potential leak sites during a leak check using soap solution; or that the system will hold a test pressure.</li> <li>d. First attempts at repair include, but are not limited to, the practices described under §§63.163(c)(2) and 63.168(g), for pumps and valves, respectively <b>Non-Confidential</b></li> </ol>

Condition Number	Conditions
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~~Emission Unit 05-06~~  
~~The owner /operator of these units is subject to 40 CFR 60 Subpart VV, Standards of Performance for Equipment Leaks of VOC in the Synthetic Organic Chemicals Manufacturing Industry. In accordance with 40 CFR 60, Subparts A & VV, the owner /operator shall comply with the requirements of all applicable provisions of these subparts. The table below lists equipment categories subject to the provisions of this subpart and the method used to show compliance.~~

Emission Unit	Equipment/Components	Method of Compliance from 40 CFR 60, Subpart VV Provisions
#2 Ox	Valves	§60.480-489
	Connectors/ Flanges	
	Pumps in Light Liquid Service	
	Agitators	
	Relief Valves (gas/vapor)	
	Relief Valves (Liquid)	
	Compressors	

~~Per 40-CFR 60. 487(c) All semiannual reports to the Administrator shall include the following information, summarized from the information in §60.486:~~

~~(e)(1) Process unit identification.~~

~~(e)(2) For each month during the semiannual reporting period,~~

~~(e)(2)(i) Number of valves for which leaks were detected as described in §60.482(7)(b) or §60.483-2,~~

~~(e)(2)(ii) Number of valves for which leaks were not repaired as required in §60.482-7(d)(1),~~

~~(e)(2)(iii) Number of pumps for which leaks were detected as described in §60.482-2(b) and (d)(6)(i),~~

~~(e)(2)(iv) Number of pumps for which leaks were not repaired as required in §60.482-2(c)(1) and (d)(6)(ii),~~

~~(e)(2)(v) Number of compressors for which leaks were detected as described in §60.482-3(f),~~

~~(e)(2)(vi) Number of compressors for which leaks were not repaired as required in §60.482-3(g)(1), and~~

~~(e)(2)(vii) The facts that explain each delay of repair and, where appropriate, why a process unit shutdown was technically infeasible.~~

*Non-Confidential*

(c)(3) Dates of process unit shutdowns which occurred within the semiannual reporting period

6.B.33

Condition Number	Conditions
6.B.34	<p>Emission Units 01-14</p> <p><u>Per Standard 5.1, the permittee shall review all new, modified, or altered sources to determine if they would increase net Volatile Organic Compounds (VOC) emissions by more than 100 tpy. If they increase net VOC emission by more than 100 tpy than Lowest Achievable Emission Rate shall be applied to construction or modifications permitted before June 25, 2004. Best Available Control Technology shall be applied to any new construction permit issued on or after June 25, 2004, when the net VOC emissions increase exceeds 100 tpy.</u></p> <p><del>To assure non-exceedance of the LAER net increase above 2831 TPY, as defined by SC Regulation 62.5, Standard No. 5.1, the permittee shall use the information required under this Part 70 operating permit, and other applicable information (e.g., emission factors) to calculate and record the actual VOC emissions from the facility on a monthly basis. The emission calculations shall include emissions from, but not be limited to, fugitive sources, process vents, equipment leaks, transfer racks (unloading and loading operations), storage tanks working, filling and breathing losses, combustion sources, and wastewater collection and treatment equipment. Reports including a summary of all recorded parameter values used in the calculations and calculated values shall be submitted to the Manager of the Technical Management Section, Bureau of Air Quality postmarked no later than 30 calendar days after the end of the reporting period. Record keeping and reporting periods shall be as follows:</del></p> <ul style="list-style-type: none"> <li><del>a. For actual emissions greater than 75 tons/year of net increase above 2831 TPY as defined by SC Regulation 62.5, Standard No. 5.1, the reporting shall be on a monthly basis.</del></li> <li><del>b. For actual emissions greater than 50 tons/year but less than 75 tons/year of net increase above 2831 TPY as defined by SC Regulation 62.5, Standard No. 5.1, the reporting shall be on a quarterly basis.</del></li> <li><del>c. For actual emissions greater than 25 tons/year but less than 50 tons/year of net increase above 2831 TPY as defined by SC Regulation 62.5, Standard No. 5.1, the reporting shall be on an annual basis.</del></li> <li><del>d. For actual emissions less than or equal to 25 tons/year of net increase above 2831 TPY as defined by SC Regulation 62.5, Standard No. 5.1 the reporting shall be on an annual basis.</del></li> </ul> <p><del>The owner/operator shall notify the Technical Management Section of initial record keeping and reporting frequency within 30 days of the effective date of the permit. The facility shall also notify the Technical Management Section upon any change in frequency due to increases in actual emissions within 10 days of the change. Once a higher record keeping and reporting frequency has been triggered, the facility must continue at the greater frequency but may petition to have the frequency adjusted for cause. These conditions shall not supersede any State or Federal requirements such as National Emission Standards for Hazardous Air Pollutants, unless these conditions would impose a more restrictive limit.</del></p>
6.B.35	<p>Emission Units 03-06</p> <p>The Department shall waive the periodic particulate matter testing requirements per SC Regulation 61-62.5, Std. 3, Section VIII and the Operator training requirements per SC Regulation 61-62.5, Std. 3, Section IX.</p>

Condition Number	Conditions
6.B.36	<p>Boilers AB-350 A/B (Boiler Nos. 3 and 4 respectively) combined are <del>each</del> permitted to burn <del>18,675,000</del><u>2,400,000</u> gallons per year of VLSD fuel oil. The owner/operator must record fuel oil consumption daily and calculate yearly fuel oil consumption on a twelve-month rolling sum. Fuel oil sulfur content shall be less than or equal to 0.5 percent by weight. Acceptable fuel oil certification can be ensured by following Department guidance entitled "Guidance For Fuel Oil Certifications" issued on May 19, 2000 and any subsequent revisions. Fuel oil supplier certification shall be obtained for each batch of oil received and stored on site. Records of fuel oil consumption and fuel oil certification shall be maintained on site for a period of at least five (5) years from the date generated and shall be made available to a Department representative upon request.</p> <p>To assure compliance with SC Regulation 61-62.1 Sec II(H) for the 2005 project adding the new boilers, the permittee shall monitor and record the following information:</p> <ol style="list-style-type: none"> <li>1. The daily VLSD fuel oil consumption and calculate the rolling twelve month sum</li> <li>2. The daily natural gas consumption</li> <li><del>3. The daily used oil consumption and calculate the rolling twelve month sum</del></li> <li><del>4.3</del> The daily biogas consumption and calculate the rolling twelve month sum</li> <li><del>5.4</del> VLSD fuel oil sulfur content shall be <math>\leq 0.5\%</math>. The Fuel oil supplier certification shall be obtained for each batch of oil received and stored on site.</li> </ol> <p>The above information shall be included in the semi-annual reports.</p> <p>Semiannual reports including fuel oil certification, fuel oil consumption, and all recorded parameters and calculated values shall be submitted to the Manager of the Technical Management Section, Bureau of Air Quality postmarked no later than 30 calendar days after the end of the reporting period.</p>
6.B.37	<p>The owner/operator shall calculate <del>SO<sub>2</sub>, NO<sub>x</sub>, CO, PM, PM<sub>10</sub> and VOC</del> emissions from Boilers AB-350A/B on a twelve-month rolling sum. The calculations shall include <del>sulfur content</del>, fuel consumption and Bureau approved emission factors from stack test data, where available. <del>SO<sub>2</sub>, NO<sub>x</sub>, CO, PM, and PM<sub>10</sub> emissions are listed in Section II A, "Emission Limitations" of this construction permit.</del> The twelve month rolling sum will be included in the semiannual report.</p>
6.B.38	<p><del>Source tests for PM, PM<sub>10</sub>, and SO<sub>2</sub> on Boilers AB-350A/B will be required. The tests shall be performed within 60 days after achieving maximum production but not later than 180 days after initial start up. The Bureau must be notified at least two weeks prior to a source test so that a Bureau representative may be present. Source test methodology, to include testing at worst case conditions, must be approved by the Bureau and comply with SC DHEC Regulation 61-62.1, Section IV-Source Testing.</del></p> <p>Source testing for PM and PM<sub>10</sub> on Boilers AB-350A/B will be required on a biennial basis after the initial source test. An initial source test will be required for SO<sub>2</sub>.</p> <p>RATA testing for the NO<sub>x</sub> and CO CEM systems will be conducted annually. The Continuous Opacity monitor requires an initial certification per 40 CFR 60 Subpart Db.</p>

Condition Number	Conditions
6.B.39	<p>Emission Unit 15-16 (Boilers AB-350 A/B)</p> <p>Per §60.48b(a), the owner or operator of an affected facility subject to the opacity standard under §60.43b shall install, calibrate, maintain, and operate a continuous monitoring system for measuring the opacity (COMs) of emissions discharged to the atmosphere and record the output of the system.</p> <p><u>However under 60.13(i)(2), if #2 fuel oil is used "infrequently", then an alternative monitoring plan can be approved as specified. The permittee will submit a request for an alternative monitoring plan.</u></p> <p><del>Logs shall be kept to record all periods of excess emissions, periods when 6 minute opacity exceeds the opacity standard, including cause, corrective action taken and preventative actions adopted. The logs shall be maintained for a period of five (5) years and be made available to the Department upon request. The owner/operator shall submit semiannual excess emissions reports within 30 days after the end of the monitoring period.</del></p> <p><u>The permittee will provide a COMs on the AB 350 A/B boilers and will not be required to do any visual observations.</u></p>
6.B.40	<p>Per §60.48b(b), the owner or operator of an affected facility subject to the NO<sub>x</sub> standard under §60.44b shall install, calibrate, maintain, and operate a continuous monitoring system for measuring the NO<sub>x</sub> (CEMs) emissions discharged to the atmosphere and record the output of the system.</p> <p><u>RATA testing for the NO<sub>x</sub> CEM system will be conducted annually.</u></p>
6.B.41	<p>Per §40.46b(e)(1), for the initial compliance test, nitrogen oxides from the steam generating unit are monitored for 30 successive steam generating unit operating days and the 30-day average emission rates used to determine compliance with the nitrogen oxides emissions standards under §60.44b. The 30-day average emission rate is calculated as the average of all hourly emissions data recorded by the monitoring system during the 30-day test period.</p>
6.B.42	<p>§60.48 states that if the owner or operator has installed a nitrogen oxides emission rate continuous emission monitoring system (CEMS) to meet the requirements of 40 CFR 75 and will continue to meet the ongoing requirements of part 75, that CEMS may be used to meet the requirements of §60.48b, except the permittee shall meet the requirements of §60.49b. S.C. Regulation 61-96.70 states that owners and operators shall comply with the monitoring and reporting requirements as provided in Subpart H Monitoring and Reporting of the NO<sub>x</sub> Budget Trading Program and in Subpart H of 40 CFR part 75. Data reported to meet the requirements of §60.49b shall not include data substituted using the missing data procedures in subpart D of part 75, nor shall the data have bias adjusted according to the procedures of part 75. The permittee has stated in the permit application that it will operate CEMS in accordance with the Part 75 provisions to measure NO<sub>x</sub> emissions discharged from the proposed boilers.</p> <p><u>RATA testing for the NO<sub>x</sub> CEM system will be conducted annually.</u></p>
6.B.43	<p>Per §60.48b(c), the continuous monitoring required shall be operated and data recorded during all period of operation of the affected facility except for continuous monitoring system breakdowns and repairs. Data shall be recorded during calibration checks, and zero and span adjustments.</p>
6.B.44	<p>Per §60.48b(e), the procedures under §60.13 shall be followed for installation, evaluation, and operation of the continuous monitoring systems.</p>
6.B.45	<p>For SO<sub>2</sub>, the permittee has elected to maintain records to demonstrate that the affected facility combusts only VLSD oil under §60.42b(j)(2). The permittee shall obtain and maintain at the affected facility fuel receipts from the fuel supplier which certify that the oil meets the definition of distillate oil as defined in §60.41b. Reports shall be submitted semiannually certifying that only VLSD oil meeting this definition was combusted in the affected facility during the reporting period.</p>
6.B.46	<p>Reports for units subject to 40 CFR 60 Subpart Db shall be submitted in accordance with §60.49b Reporting And Recordkeeping Requirements. As stated in §60.49b, the permittee must submit reports on a semiannual basis. The semiannual reports shall be submitted to the Manager of the Technical Management Section, Bureau of Air Quality postmarked no later than 30 days after the end of the reporting period. <u>The reports may be included in the Title V semi-annual reports.</u></p>

Condition Number	Conditions
6.B.47	<p><del>To demonstrate initial compliance for PM and HCl for 40 CFR 63 Subpart DDDDD, the permittee must include a signed statement in the NOCS report required in §63.7545(e) that indicates the facility burns only liquid fossil fuels other than residual oils, either alone or in combination with gaseous fuels.</del></p> <p><del>To demonstrate continuous compliance with the applicable PM and HCl emission limits, the permittee must also keep records that demonstrate that the facility burns only liquid fossil fuels other than residual oils, either alone or in combination with gaseous fuels. For each boiler or process heater subject to an emission limit, the permittee must also keep the records in paragraphs(d)(1) through (5), where applicable of §63.7555.</del></p> <p><del>Section 1 of §63.7555 states that the permittee must keep records of monthly fuel use by each boiler or process heater, including the type(s) of fuel and amount(s) used.</del></p>
6.B.48	<p><del>The permittee must also include a signed statement in each semiannual compliance report required in §63.7550 that indicates that the facility burned only liquid fossil fuels other than residual oils, either alone or in combination with gaseous fuels.</del></p>
6.B.49	<p><del>Since the facility has an applicable work practice standard for CO and boilers that will be in the large liquid fuel subcategory, a CEMS for CO must be installed, operated, and maintained according to the procedures in paragraphs (a)(1) through (6) of §63.7525 by the compliance date specified in §63.7495.</del></p> <p><del>(1) Each CEMS must be installed, operated, and maintained according to Performance Specification (PS) 4A of 40 CFR part 60, appendix B, and according to the site specific monitoring plan developed according to §63.7505(d).</del></p> <p><del>(2) The owner/operator must conduct a performance evaluation of each CEMS according to the requirements in §63.8 and according to PS 4A of 40 CFR part 60, appendix B.</del></p> <p><del>(3) Each CEMS must complete a minimum of one cycle of operation (sampling, analyzing, and data recording) for each successive 15-minute period.</del></p> <p><del>(4) The CEMS data must be reduced as specified in §63.8(g)(2).</del></p> <p><del>(5) The owner/operator must calculate and record a 30-day rolling average emission rate on a daily basis. A new 30-day rolling average emission rate is calculated as the average of all of the hourly CO emission data for the preceding 30 operating days.</del></p> <p><del>(6) For purposes of calculating data averages, the owner/operator must not use data recorded during periods of monitoring malfunctions, associated repairs, out-of-control periods, required quality assurance or control activities, or when the boiler or process heater is operating at less than 50 percent of its rated capacity. The owner/operator must use all the data collected during all other periods in assessing compliance.</del></p> <p><del>Logs shall be kept to record all periods of deviation/excess emissions, periods when CEM value averaged over appropriate period exceeds the standard, including cause, corrective action taken and preventative actions adopted. The logs shall be maintained for a period of two (2) years and be made available to the Department upon request. The owner/operator shall submit semiannual deviation/excess emissions reports within 30 days after the end of the monitoring period.</del></p> <p><del>Any period for which the monitoring system is out of control and data are not available for required calculations constitutes a deviation from the monitoring requirements.</del></p>
	<p><u>Conditions 6.B.47, 6.B.48 and 6.B.49 Voided</u></p>
6.B.50	<p><del>Per 40 CFR 63 Subpart DDDDD, the facility will comply with the SSM plan requirements as applicable.</del></p> <p><u>40 CFR 63 Subpart DDDDD</u></p> <p>As stated in §63.7550, the permittee must submit reports on a semiannual basis according to the requirements in §63.7550(b). The semiannual reports shall be submitted to the Manager of the Technical Management Section, Bureau of Air Quality postmarked no later than 30 days after the end of the reporting period.</p>

Condition Number	Conditions
6.B.51	<p>Emission Unit 15-16 (Boilers AB-350 A/B)</p> <p>Per S.C. Regulation 61-62.96, Boilers AB-350 A/B will be NO<sub>x</sub> Budget units and the permittee to the extent applicable shall comply with the monitoring and reporting requirements as provided in subpart H of SC Regulation 61-62.96 and in subpart H of 40 CFR part 75. The NO<sub>x</sub> authorized account representative shall comply with all record keeping and reporting requirements in SC Regulation 61-62.96.74 and with the requirements of SC Regulation 61-62.96.10(e). Quarterly reports, as specified in SC Regulation 61-62.96.74(d), shall be sent to EPA and to SC DHEC Bureau of Air Quality's Technical Management Section at the addresses listed in Section 1 of this permit.</p> <p>Unless otherwise provided, the owners and operators of the NO<sub>x</sub> Budget source and each NO<sub>x</sub> Budget unit at the source shall keep on site at the source each of the following documents for a period of 5 years from the date the document is created. This period may be extended for cause, at any time prior to the end of 5 years, in writing by the Department or the EPA.</p> <p>(i) The account certificate of representation for the NO<sub>x</sub> authorized account representative for the source and each NO<sub>x</sub> Budget unit at the source and all documents that demonstrate the truth of the statements in the account certificate of representation, in accordance with Section 96.13; provided that the certificate and documents shall be retained on site at the source beyond such 5-year period until such documents are superseded because of the submission of a new account certificate of representation changing the NO<sub>x</sub> authorized account representative.</p> <p>(ii) All emissions monitoring information, in accordance with subpart H of this regulation; provided that to the extent that subpart H of this regulation provides for a 3-year period for record keeping, the 3-year period shall apply.</p> <p>(iii) Copies of all reports, compliance certifications, and other submissions and all records made or required under the NO<sub>x</sub> Budget Trading Program.</p> <p>(iv) Copies of all documents used to complete a NO<sub>x</sub> Budget permit application and any other submission under the NO<sub>x</sub> Budget Trading Program or to demonstrate compliance with the requirements of the NO<sub>x</sub> Budget Trading Program.</p>
6.B.52	<p>Per S.C. Regulation 61-62.96, the NO<sub>x</sub> authorized account representative of each NO<sub>x</sub> Budget source required to have a federally enforceable permit and each NO<sub>x</sub> Budget unit required to have a federally enforceable permit at the source shall:</p> <p>(i) Submit to the Department a complete NO<sub>x</sub> Budget permit application under Section 96.22 in accordance with the deadlines specified in Section 96.21(b) and (c);</p> <p>(ii) Submit in a timely manner any supplemental information that the Department determines is necessary in order to review a NO<sub>x</sub> Budget permit application and issue or deny a NO<sub>x</sub> Budget permit.</p>



Condition Number	Conditions
6.B.53	<p>This source is subject to SC Regulation 61-62.96, Nitrogen Oxides (NO<sub>x</sub>) Budget Trading Program, and shall comply with all applicable provisions.</p> <p>The owners and operators, and to the extent applicable, the NO<sub>x</sub> authorized account representative of a NO<sub>x</sub> Budget unit, shall comply with the monitoring and reporting requirements as provided in subpart H of SC Regulation 61-62.96 and in subpart H of 40 CFR part 75. For purposes of complying with such requirements, the definitions in SC Regulation 61-62.96.2 and in 40 CFR part 72 section 72.2 shall apply, and the terms “affected unit,” “designated representative,” and “continuous emission monitoring system” (or “CEMS”) in 40 CFR part 75 shall be replaced by the terms “NO<sub>x</sub> Budget unit,” “NO<sub>x</sub> authorized account representative,” and “continuous emission monitoring system” (or “CEMS”), respectively, as defined in SC Regulation 61-62.96.2.</p> <p>The NO<sub>x</sub> authorized account representative shall comply with all record keeping and reporting requirements in SC Regulation 61-62.96.74 and with the requirements of SC Regulation 61-62.96.10(e). Quarterly reports, as specified in SC Regulation 61-62.96.74(d), shall be sent to EPA and to SC DHEC, Bureau of Air Quality’s Technical Management Section at the addresses listed below.</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p><b>US EPA, Region 4</b>  <b>Air Enforcement Branch</b>  <b>61 Forsyth Street</b>  <b>Atlanta, GA 30303</b></p> </div> <div style="text-align: center;"> <p><b>SC DHEC - BAQ</b>  <b>Technical Management Section</b>  <b>2600 Bull Street</b>  <b>Columbia, SC 29201</b></p> </div> </div> <p>If the NO<sub>x</sub> authorized account representative for a NO<sub>x</sub> Budget unit subject to an Acid Rain Emission limitation who signed and certified any submission that is made under subpart F or G of 40 CFR part 75 and which includes data and information required under this subpart or subpart H of 40 CFR part 75 is not the same person as the designated representative or the alternative designated representative for the unit under 40 CFR part 72, the submission must also be signed by the designated representative or the alternative designated representative.</p>
6.B.54	<p>Unless otherwise provided, the owners and operators of the NO<sub>x</sub> Budget source and each NO<sub>x</sub> Budget unit at the source shall keep on site at the source each of the following documents for a period of 5 years from the date the document is created. This period may be extended for cause, at any time prior to the end of 5 years, in writing by the Department or the EPA.</p> <ul style="list-style-type: none"> <li>(i) The account certificate of representation for the NO<sub>x</sub> authorized account representative for the source and each NO<sub>x</sub> Budget unit at the source and all documents that demonstrate the truth of the statements in the account certificate of representation, in accordance with Section 96.13; provided that the certificate and documents shall be retained on site at the source beyond such 5-year period until such documents are superseded because of the submission of a new account certificate of representation changing the NO<sub>x</sub> authorized account representative.</li> <li>(ii) All emissions monitoring information, in accordance with subpart H of this regulation; provided that to the extent that subpart H of this regulation provides for a 3-year period for record keeping, the 3-year period shall apply.</li> <li>(iii) Copies of all reports, compliance certifications, and other submissions and all records made or required under the NO<sub>x</sub> Budget Trading Program.</li> <li>(iv) Copies of all documents used to complete a NO<sub>x</sub> Budget permit application and any other submission under the NO<sub>x</sub> Budget Trading Program or to demonstrate compliance with the requirements of the NO<sub>x</sub> Budget Trading Program.</li> </ul>

Condition Number	Conditions												
6.B.55	<p>This facility shall be allowed to operate temporary units such as generators, compressors, and other diesel-driven portable units for emergency, overhaul, maintenance, or similar activities that will have a duration of six months or less. These units shall be equipped with hour meter indicators or other method for recording actual hours of use. Emissions from the use of such equipment must be added to the facility wide totals, if applicable. The owner/operator shall, record for each unit: 1) the size of unit, 2) the date the unit brought on site, 3) the date of first use, 4) the total hours operated, 5) the purpose served by unit, 6) the date unit was removed from site, and 7) the emissions from use. The facility shall not be required to notify the Bureau prior to operating these units. Permanent units, including emergency equipment, shall require prior notification and approval by the Bureau and will be shown in the facility’s operating permit as permitted, insignificant, or exempt sources. Units used for peak shaving or load reductions cannot be considered emergency generators.</p>												
6.B.56	<p>Emission Unit 03</p> <p><del>The facility shall implement a VOC LDAR (Leak Detection and Repair Program) equivalent to the requirements of 40 CFR 60 Subpart VV (per the regulation as of November 1, 2006) and submit to the Department before placing construction permit 0420-0029 CR into operation. The use of the LDAR program was voluntarily used for the purpose of a PSD offset.</del></p> <p><del>The owner/operator of these units shall comply with 40 CFR 60 Subpart VV (per regulation as of November 1, 2006), Standards of Performance for Equipment Leaks of VOC in the Synthetic Organic Chemicals Manufacturing Industry. In accordance with 40 CFR 60, Subparts A &amp; VV, the owner /operator shall comply with the requirements of all applicable provisions of these subparts. The table below lists equipment categories subject to the provisions of this subpart and the method used to show compliance.</del></p> <table><tr><th>Emission Unit</th><th>Equipment/Components</th><th>Method of Compliance from 40 CFR 60, Subpart VV Provisions</th></tr><tr><td rowspan="7">#1 Ox</td><td>Valves</td><td rowspan="7">\$60.480-489</td></tr><tr><td>Connectors/ Flanges</td></tr><tr><td>Pumps in Light Liquid Service</td></tr><tr><td>Agitators</td></tr><tr><td>Relief Valves (gas/vapor)</td></tr><tr><td>Relief Valves (Liquid)</td></tr><tr><td>Compressors</td></tr></table>	Emission Unit	Equipment/Components	Method of Compliance from 40 CFR 60, Subpart VV Provisions	#1 Ox	Valves	\$60.480-489	Connectors/ Flanges	Pumps in Light Liquid Service	Agitators	Relief Valves (gas/vapor)	Relief Valves (Liquid)	Compressors
Emission Unit	Equipment/Components	Method of Compliance from 40 CFR 60, Subpart VV Provisions											
#1 Ox	Valves	\$60.480-489											
	Connectors/ Flanges												
	Pumps in Light Liquid Service												
	Agitators												
	Relief Valves (gas/vapor)												
	Relief Valves (Liquid)												
	Compressors												

Condition Number	Conditions
6.B.57	<p><del>Emission Unit 03</del></p> <p><del>Per 40 CFR 60 Subpart VV 60.487(a), each owner or operator subject to the provisions of subpart VV shall submit semiannual reports to the Bureau (for construction permit beginning six months after the initial start up date)(for construction permit CR).</del></p> <p><del>(b) The initial semiannual report to the Bureau shall include the following information:</del></p> <p><del>(b)(1) Process unit identification.</del></p> <p><del>(b)(2) Number of valves subject to the requirements of §60.482-7, excluding those valves designated for no detectable emissions under the provisions of §60.482-7(f).</del></p> <p><del>(b)(3) Number of pumps subject to the requirements of §60.482-2, excluding those pumps designated for no detectable emissions under the provisions of §60.482-2(e) and those pumps complying with §60.482-2(f).</del></p> <p><del>(b)(4) Number of compressors subject to the requirements of §60.482-3, excluding those compressors designated for no detectable emissions under the provisions of §60.482-3(i) and those compressors complying with §60.482-3(h).</del></p> <p><del>(e) All semiannual reports to the Administrator shall include the following information, summarized from the information in §60.486:</del></p> <p><del>(e)(1) Process unit identification.</del></p> <p><del>(e)(2) For each month during the semiannual reporting period:</del></p> <p><del>(e)(2)(i) Number of valves for which leaks were detected as described in §60.482(7)(b) or §60.483-2.</del></p> <p><del>(e)(2)(ii) Number of valves for which leaks were not repaired as required in §60.482-7(d)(1).</del></p> <p><del>(e)(2)(iii) Number of pumps for which leaks were detected as described in §60.482-2(b) and (d)(6)(i).</del></p> <p><del>(e)(2)(iv) Number of pumps for which leaks were not repaired as required in §60.482-2(e)(1) and (d)(6)(ii).</del></p> <p><del>(e)(2)(v) Number of compressors for which leaks were detected as described in §60.482-3(f).</del></p> <p><del>(e)(2)(vi) Number of compressors for which leaks were not repaired as required in §60.482-3(g)(1), and</del></p> <p><del>(e)(2)(vii) The facts that explain each delay of repair and, where appropriate, why a process unit shutdown was technically infeasible.</del></p> <p><del>(e)(3) Dates of process unit shutdowns which occurred within the semiannual reporting period.</del></p> <p><del>(e)(4) Revisions to items reported according to paragraph (b) if changes have occurred since the initial report or subsequent revisions to the initial report.</del></p>

## **ATTACHMENT B**

### **Insignificant Activities**

#### **BP Amoco Chemical Company-Cooper River Plant**

**TV-0420-0029**

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The following table contains a list of activities which are considered insignificant pursuant to SC Regulation 61-62.70.5(c). Sources listed below are not exempt from any otherwise applicable state or federal requirements including, but not limited to, opacity standards, ambient air quality standards, and air toxic standards.

<b>Equip ID</b>	<b>Source Description</b>	<b>Installation Date/ Modification Date</b>	<b>Basis</b>
IA-5	Facility Maintenance-Process Vessel and Tank Cleaning	N/A	Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP
IA-6	Facility Maintenance-Purging of Natural Gas Lines	N/A	Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP
IA-8	Facility Maintenance – General Vehicle Maintenance and Service Activities including but not limited to Railcars	N/A	Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP
IA-9	Facility Maintenance- Vehicle fueling (diesel & gasoline)	N/A	Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP
IA-10	Facility Maintenance-Metals machining solvents including cutting oils	N/A	Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP
IA-11	Facility Maintenance-Grinding activities	N/A	Emissions total < 5 TPY of PM Emission total < .5 TPY of HAP
IA-12	Facility Maintenance-Catalyst change out/unit turnarounds	N/A	Emissions total < 5 TPY of VOC Emission total < 5 TPY of PM Emission total < .5 TPY of HAP
IA-13	Facility Maintenance-Insulation work	N/A	Emission total < 5 TPY of PM
IA-14	Facility Maintenance-Filter change out	N/A	Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP
IA-19	Wastewater & Stormwater Management-Filter pressing	N/A	Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP
IA-21	Remediation-Vacuum Truck Operations	N/A	Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP
IA-23	Remediation-Stockpiled contaminated soils	N/A	Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP
IA-24	Remediation-Groundwater sampling and level monitoring	N/A	Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP
IA-25	Remediation-Soil Coring	N/A	Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP

Equip ID	Source Description	Installation Date/ Modification Date	Basis
IA-26	Remediation-Asbestos Abatement	N/A	Emissions total < 5 TPY of PM Emission total < .5 TPY of HAP
IA-43	Lime Storage, Spent Lime, and Clay Handling activities	N/A	Emissions total < 5 TPY of PM Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP
IA-44	Fuel Oil and Paraxylene Separators	1977	Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP
<del>IA-47</del>			<b>Should not be listed In Title V permit since on IA list Section A #5</b>
<del>IA-48</del>			
IA-57	Herbicide and Insecticide Application Activities	N/A	Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP
<del>IA-58</del>			<b>Should not be listed In Title V permit since on IA list Section A #5</b>
AF-1001	< 10,000 gallon – Storehouse-Diesel Storage Tank	1992	Insignificant Activity B.3
AF-1000	< 10,000 gallon – Storehouse-Gasoline Storage Tank	1992	Insignificant Activity B.3
AD-206A	Utilities-<2,000 gallon Cooling Tower Additive Tank	2009	Insignificant Activity B.3
AD-206B	Utilities-<2,000 gallon Cooling Tower Additive Tank	2009	Insignificant Activity B.3
AF-211	Utilities-6300 gallon Water Coagulant Tk		Insignificant Activity B.3
AF-306	Utilities-1000 gal Steam Additive Tk		Insignificant Activity B.3
AF-307	Utilities-1000 gallon Boiler Water Additive		Insignificant Activity B.3
AF-309	Utilities-1000 gallon Boiler Water Additive		Insignificant Activity B.3
AF-313	Utilities-<1000 gallon Polymer Additive Tank	1994	Insignificant Activity B.3
DF-901	Utilities-<1000 gallon Polymer Additive Tank	1998	Insignificant Activity B.3
AF-1320	Utilities-1000 gallon Cooling Tower Additive Tank	2004	Insignificant Activity B.3
AF-803	#2 VLSD Fuel Oil Day Storage Tank (TK-5)	1977	Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP
<del>AT-201</del>	<del>#1 Cooling Tower</del>	<del>1977</del>	<del>Insignificant Activity A.20</del>
<del>AT-202</del>	<del>#2 Cooling Tower</del>	<del>1997</del>	<del>Insignificant Activity A.20</del>
BD-100	230 gallon Chiller Expansion Tank	1989	Insignificant Activity B.3
BD-102	50 gallon Injection Tank	1984	Insignificant Activity B.3
BD-725	1500 gallon DHT Waste Condensate	1996	Insignificant Activity B.3
BD-910	500 gallon Steam Condensate Chemical Storage	1993	Insignificant Activity B.3
BD-911	560 gallon Steam Condensate Chemical	1979	Insignificant Activity B.3
BD-912	560 gallon Steam Condensate Chemical Storage	1993	Insignificant Activity B.3
BD-913	100 gallon Chemical Mix (Steam System Tank)	1997	Insignificant Activity B.3
BD-915	2,000 gallon Steam Condensate Chemical Storage	1997	Insignificant Activity B.3
BF-1402	95,000 gallon Liquid Catalyst Tank	1997	Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP
BF-1404	6,600 gallon Hydrobromic Acid (HBr)	2004	Non-regulated pollutant
<del>BM-1201</del>			<b>Shouldn't be listed in Title V permit</b>

Equip ID	Source Description	Installation Date/ Modification Date	Basis
<del>SO-100</del>			since on IA list Section A #18
BF-713	1050 gallon Lube Oil Reservoir Tank (LPVGT)	1995	Insignificant Activity B.3
CD-501	32,100 gallon Recycle Solvent Drum (Process Water)	1979	Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP
<del>CF-401A</del>			Shouldn't be listed in Title V permit since on IA list Section A #18
<del>CF-401B</del>			
<del>CF-401C</del>			
DF-901	100 gallon Polymer Additive Tk	2008	Insignificant Activity B.3
DF-902	400 gallon Steam Condensate Chemical	2008	Insignificant Activity B.3
DD-913	100 gallon Chemical Mix (Steam System Tank)	1996	Insignificant Activity B.3
AM-840	PX Pump Emergency Generator (230 KW)	07/2006	Insignificant Activity B.2.b
AM-846	Main Gate Emergency Generator (50 KW)	5/2005	Insignificant Activity B.2.a
AM-847	Contractor Gate Emergency Generator (20 KW)	5/2005	Insignificant Activity B.2.a
AM-848	T-Head Emergency Generator (50 KW)	5/2205	Insignificant Activity B.2.a
AM-849	WWT Control Room Emergency Generator (60 KW)	12/2007	Insignificant Activity B.2.a
AM-819	Administration Building Emergency Generator (50 KW)	04/2005	Insignificant Activity B.2.a

N/A = Not Applicable

# Appendix F

## Federal Land Manager Reply

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## Doerner, Michael

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**From:** Collins, Catherine <catherine\_collins@fws.gov>  
**Sent:** Tuesday, March 12, 2013 2:44 PM  
**To:** Doerner, Michael  
**Subject:** Re: FW: BP Cooper River PSD Permit Application

Thank you for sending the information regarding the project near the Cape Romain National Wildlife Refuge. Based on the emission changes identified in the document and distance from the Class I area(s) listed below, the Fish and Wildlife Service anticipates that modeling would not show any significant additional impacts to air quality related values (AQRV) at the Class I area(s) administered by the FWS. Therefore, we are not requesting that a Class I AQRV analysis be included in the PSD permit application. Our screening of this analysis does not indicate agreement with any AQRV analysis protocols or conclusions applicants may make independent of Federal Land Manager review. Please note that we are specifically addressing the need for an AQRV analysis for Class I areas managed by the Fish and Wildlife Service.

Class I Area:

Cape Romain NWR

Distance to Facility in kilometers

21.6 km

Annual Emissions (based on short term maximum emission rates adjusted to an annual emission rate) in tons per year (tpy)

+ 27.4	Nitrogen Oxides
+ 0.3	Sulfur Oxides
+ 4.7	Total Fine particulate matter
+ 72.6	Volatile organic compounds
+ 439.6	Carbon Monoxide

The state and/or EPA may have a different opinion regarding the need for a Class I increment analysis. Should the emissions or the nature of the project change significantly, please contact me, so that we might re-evaluate the revised proposed project.

Thank you for keeping us informed and involving the Fish and Wildlife Service in the project review.

Catherine Collins, Environmental Engineer  
U.S. Fish and Wildlife Service  
Air Quality Branch  
7333 W. Jefferson Ave., Suite 375  
Lakewood, CO 80235-2034



# Appendix G

## Air Modeling Information

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The air modeling information is provided in the attached compact disc.

# Appendix H

## USEPA Control Technology Fact Sheet – Incinerators

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## Air Pollution Control Technology Fact Sheet

See Bottom of page 3

**Name of Technology:** Thermal Incinerator

This type of incinerator is also referred to as a direct flame incinerator, thermal oxidizer, or afterburner. However, the term afterburner is generally appropriate only to describe a thermal oxidizer used to control gases coming from a process where combustion is incomplete.

**Type of Technology:** Destruction by thermal oxidation

**Applicable Pollutants:** Primarily volatile organic compounds (VOC). Some particulate matter (PM), commonly composed as soot (particles formed as a result of incomplete combustion of hydrocarbons (HC), coke, or carbon residue) will also be destroyed in various degrees.

### Achievable Emission Limits/Reductions:

VOC destruction efficiency depends upon design criteria (i.e., chamber temperature, residence time, inlet VOC concentration, compound type, and degree of mixing) (EPA, 1992). Typical thermal incinerator design efficiencies range from 98 to 99.99% and above, depending on system requirements and characteristics of the contaminated stream (EPA, 1992; EPA, 1996a). The typical design conditions needed to meet 98% or greater control or a 20 parts per million by volume (ppmv) compound exit concentration are: 870°C (1600°F) combustion temperature, 0.75 second residence time, and proper mixing. For halogenated VOC streams, 1100°C (2000°F) combustion temperature, 1.0 second residence time, and use of an acid gas scrubber on the outlet is recommended (EPA, 1992).

For vent streams with VOC concentration below approximately 2000 ppmv, reaction rates decrease, maximum VOC destruction efficiency decreases, and an incinerator outlet VOC concentration of 20 ppmv, or lower may be achieved (EPA, 1992).

Controlled emissions and/or efficiency test data for PM in incinerators are not generally available in the literature. Emission factors for PM in phthalic anhydride processes with incinerators are available, however. The PM control efficiencies for these processes were found to vary from 79 to 96% (EPA, 1998). In EPA's 1990 National Inventory, incinerators used as control devices for PM were reported as achieving 25 to 99% control efficiency of particulate matter 10 microns or less in aerodynamic diameter (PM<sub>10</sub>) at point source facilities (EPA, 1998). Table 1 presents a breakdown of the PM<sub>10</sub> control efficiency ranges by industry for recuperative incinerators (EPA, 1996b). The VOC control efficiency reported for these devices ranged from 0 to 99.9%. These ranges of control efficiencies are large because they include facilities that do not have VOC emissions and control only PM, as well as facilities which have low PM emissions and are primarily concerned with controlling VOC (EPA, 1998).

Table 1. Thermal Incinerator PM<sub>10</sub> Destruction Efficiencies by Industry (EPA, 1996b)

Industry/Types of Sources	PM <sub>10</sub> Control Efficiency (%)
<b>Petroleum and Coal Products</b> asphalt roofing processes (blowing, felt saturation); mineral calcining; petroleum refinery processes (asphalt blowing, catalytic cracking, coke calcining, sludge converter); sulfur manufacturing	25 - 99.9
<b>Chemical and Allied Products</b> carbon black manufacturing (mfg); charcoal mfg; liquid waste disposal; miscellaneous chemical mfg processes; pesticide mfg; phthalic anhydride mfg (xylene oxidation); plastics/synthetic organic fiber mfg; solid waste incineration (industrial)	50 - 99.9
<b>Primary Metals Industries</b> by-product coke processes (coal unloading, oven charging and pushing, quenching); gray iron cupola and other miscellaneous processes; secondary aluminum processes (burning/drying, smelting furnace); secondary copper processes (scrap drying, scrap cupola, and miscellaneous processes); steel foundry miscellaneous processes; surface coating oven	70 - 99.9
<b>Electronic and Other Electric Equipment</b> chemical mfg miscellaneous processes; electrical equipment bake furnace; fixed roof tank; mineral production miscellaneous processes; secondary aluminum roll/draw extruding; solid waste incineration (industrial)	70 - 99.9
<b>Electric, Gas, and Sanitary Services</b> internal combustion engines; solid waste incineration (industrial, commercial/ institutional)	90 - 98
<b>Stone, Clay, and Glass Products</b> barium processing kiln; coal cleaning thermal dryer; fabricated plastics machinery; wool fiberglass mfg	50 - 95
<b>Food and Kindred Products</b> charcoal processing, miscellaneous; corn processing, miscellaneous, fugitive processing, miscellaneous; soybean processing, miscellaneous	70 - 98
<b>Mining</b> asphalt concrete rotary dryer; organic chemical air oxidation units, sulfur production	70 - 99.6
<b>National Security and International Affairs</b> solid waste incineration (commercial/institutional and municipal)	70
<b>Textile Mill Products</b> plastics/synthetic organic fiber (miscellaneous processes)	88 - 95
<b>Industrial Machinery and Equipment</b> secondary aluminum processes (burning/drying, smelt furnace)	88 - 98
<b>Lumber and Wood Products</b> solid waste incineration (industrial)	70
<b>Transportation Equipment</b> solid waste incineration (industrial)	70 - 95

**Applicable Source Type:** Point

**Typical Industrial Applications:**

Thermal incinerators can be used to reduce emissions from almost all VOC sources, including reactor vents, distillation vents, solvent operations, and operations performed in ovens, dryers, and kilns. They can handle minor fluctuations in flow, however, excess fluctuations require the use of a flare (EPA, 1992). Their fuel consumption is high, so thermal units are best suited for smaller process applications with moderate-to-high VOC loadings.

Incinerators are used to control VOC from a wide variety of industrial processes, including, but not limited to the following (EPA, 1992):

- Storing and loading/unloading of petroleum products and other volatile organic liquids;
- Vessel cleaning (rail tank cars and tank trucks, barges);
- Process vents in the synthetic organic chemical manufacturing industry (SOCMI);
- Paint manufacturing;
- Rubber products and polymer manufacturing;
- Plywood manufacturing;
- Surface coating operations:
  - Appliances, magnetic wire, automobiles, cans, metal coils, paper, film and foil, pressure sensitive tapes and labels, magnetic tape, fabric coating and printing, metal furniture, wood furniture, flatwood paneling, aircraft, miscellaneous metal products;
- Flexible vinyl and urethane coating;
- Graphic arts industry; and
- Hazardous waste treatment storage, and disposal facilities (TSDFs).

**Emission Stream Characteristics:**

- a. **Air Flow:** Typical gas flow rates for thermal incinerators are 0.24 to 24 standard cubic meters per second ( $\text{sm}^3/\text{sec}$ ) (500 to 50,000 standard cubic feet per minute (scfm)) (EPA, 1996a).
- b. **Temperature:** Most incinerators operate at higher temperatures than the ignition temperature, which is a minimum temperature. Thermal destruction of most organic compounds occurs between  $590^\circ\text{C}$  and  $650^\circ\text{C}$  ( $1100^\circ\text{F}$  and  $1200^\circ\text{F}$ ). Most hazardous waste incinerators are operated at  $980^\circ\text{C}$  to  $1200^\circ\text{C}$  ( $1800^\circ\text{F}$  to  $2200^\circ\text{F}$ ) to ensure nearly complete destruction of the organics in the waste (AWMA, 1992).
- a. **Pollutant Loading:** Thermal incinerators can be used over a fairly wide range of organic vapor concentrations. For safety considerations, the concentration of the organics in the waste gas must be substantially below the lower flammable level (lower explosive limit, or LEL) of the specific compound being controlled. As a rule, a safety factor of four (i.e., 25% of the LEL) is used (EPA, 1991, AWMA, 1992). The waste gas may be diluted with ambient air, if necessary, to lower the concentration. Considering economic factors, thermal incinerators perform best at inlet concentrations of around 1500 to 3000 ppmv, because the heat of combustion of hydrocarbon gases is sufficient to sustain the high temperatures required without addition of expensive auxiliary fuel (EPA, 1995).
- d. **Other Considerations:** Incinerators are not generally recommended for controlling gases containing halogen- or sulfur-containing compounds, because of the formation of hydrogen chloride, hydrogen fluoride gas, sulfur dioxide, and other highly corrosive acid gases. It may be necessary to install a post-oxidation acid gas treatment system in such cases, depending on the outlet concentration. This would likely make incineration an uneconomical option. (EPA, 1996a). Thermal

incinerators are also not generally cost-effective for low-concentration, high-flow organic vapor streams (EPA, 1995).

#### **Emission Stream Pretreatment Requirements:**

Typically, no pretreatment is required, however, in some cases, a concentrator (e.g., carbon or zeolite adsorption) may be used to reduce the total gas volume to be treated by the more expensive incinerator.

#### **Cost Information:**

The following are cost ranges (expressed in 2002 dollars) for packaged thermal incinerators of conventional design under typical operating conditions, developed using EPA cost-estimating spreadsheets (EPA, 1996a) and referenced to the volumetric flow rate of the waste stream treated. The costs do not include costs for a post-oxidation acid gas treatment system. Costs can be substantially higher than in the ranges shown when used for low to moderate VOC concentration streams (less than around 1000 to 1500 ppmv). As a rule, smaller units controlling a low concentration waste stream will be much more expensive (per unit volumetric flow rate) than a large unit cleaning a high pollutant load flow. Operating and Maintenance (O & M) Costs, Annualized Cost, and Cost Effectiveness are dominated by the cost of supplemental fuel required.

- a. **Capital Cost:** \$53,000 to \$190,000 per  $\text{sm}^3/\text{sec}$  (\$25 to \$90 per scfm)
- b. **O & M Cost:** \$11,000 to \$160,000 per  $\text{sm}^3/\text{sec}$  (\$5 to \$75 per scfm), annually
- c. **Annualized Cost:** \$17,000 to \$208,000 per  $\text{sm}^3/\text{sec}$  (\$8 to \$98 per scfm), annually
- d. **Cost Effectiveness:** \$440 to \$3,600 per metric ton (\$400 to \$3,300 per short ton), annualized cost per ton per year of pollutant controlled

#### **Theory of Operation:**

Incineration, or thermal oxidation is the process of oxidizing combustible materials by raising the temperature of the material above its auto-ignition point in the presence of oxygen, and maintaining it at high temperature for sufficient time to complete combustion to carbon dioxide and water. Time, temperature, turbulence (for mixing), and the availability of oxygen all affect the rate and efficiency of the combustion process. These factors provide the basic design parameters for VOC oxidation systems (ICAC, 1999).

A straight thermal incinerator is comprised of a combustion chamber and does not include any heat recovery of exhaust air by a heat exchanger (this type of incinerator is referred to as a recuperative incinerator).

The heart of the thermal incinerator is a nozzle-stabilized flame maintained by a combination of auxiliary fuel, waste gas compounds, and supplemental air added when necessary. Upon passing through the flame, the waste gas is heated from its preheated inlet temperature to its ignition temperature. The ignition temperature varies for different compounds and is usually determined empirically. It is the temperature at which the combustion reaction rate exceeds the rate of heat losses, thereby raising the temperature of the gases to some higher value. Thus, any organic/air mixture will ignite if its temperature is raised to a sufficiently high level (EPA, 1996a).

The required level of VOC control of the waste gas that must be achieved within the time that it spends in the thermal combustion chamber dictates the reactor temperature. The shorter the residence time, the higher the reactor temperature must be. The nominal residence time of the reacting waste gas in the combustion chamber is defined as the combustion chamber volume divided by the volumetric flow rate of the gas. Most thermal units are designed to provide no more than 1 second of residence time to the waste gas with typical temperatures of 650 to 1100°C (1200 to 2000°F). Once the unit is designed and built, the residence time is

not easily changed, so that the required reaction temperature becomes a function of the particular gaseous species and the desired level of control (EPA, 1996a).

Studies based on actual field test data, show that commercial incinerators should generally be run at 870°C (1600°F) with a nominal residence time of 0.75 seconds to ensure 98% destruction of non-halogenated organics (EPA, 1992).

#### **Advantages:**

Incinerators are one of the most positive and proven methods for destroying VOC, with efficiencies up to 99.9999% possible. Thermal incinerators are often the best choice when high efficiencies are needed and the waste gas is above 20% of the LEL.

#### **Disadvantages:**

Thermal incinerator operating costs are relatively high due to supplemental fuel costs.

Thermal incinerators are not well suited to streams with highly variable flow because of the reduced residence time and poor mixing during increased flow conditions which decreases the completeness of combustion. This causes the combustion chamber temperature to fall, thus decreasing the destruction efficiency (EPA, 1991).

Incinerators, in general, are not recommended for controlling gases containing halogen- or sulfur-containing compounds because of the formation of highly corrosive acid gases. It may be necessary to install a post-oxidation acid gas treatment system in such cases, depending on the outlet concentration (EPA, 1996a). Thermal incinerators are also not generally cost-effective for low-concentration, high-flow organic vapor streams (EPA, 1995).

#### **Other Considerations:**

Thermal incinerators are not usually as economical, on an annualized basis, as recuperative or regenerative incinerators because they do not recover waste heat energy from the exhaust gases. This heat can be used to preheat incoming air, thus reducing the amount of supplemental fuel required. If there is additional heat energy available, it can be used for other process heating needs.

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